

INSIDE: iPad Pro FIRST IMPRESSIONS

# PCWorld

DECEMBER 2015



## M.2 SSD Roundup

Tiny drives, huge performance

I was one of the **1** in **5**  
Children in America who  
**STRUGGLE WITH HUNGER**  
join me and help put an  
End to childhood hunger.

Viola Davis

**HUNGER IS  
ALL OF US**

**HELP UNDO CHILDHOOD HUNGER. GO TO [HUNGERIS.ORG](http://HUNGERIS.ORG)**

THE  
SAFeway   
FOUNDATION

The *Hunger Is* campaign is a collaboration between The Safeway Foundation and the Entertainment Industry Foundation to raise awareness and improve the health of hungry children.

 **EIF**  
ENTERTAINMENT  
INDUSTRY FOUNDATION

The Safeway Foundation and the Entertainment Industry Foundation are 501(c)(3) tax-exempt organizations. Photo by: Nigel Parry

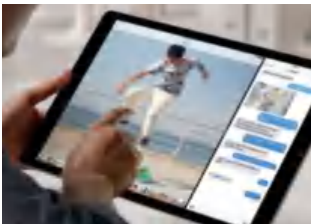
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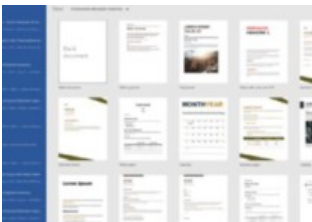
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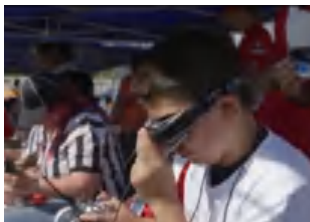
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## PUBLICATION INFORMATION

Volume 33, number 12 *PCWorld*™ (ISSN 0737-8939) is published monthly at \$24.95 for one year (12 issues) by IDG Consumer & SMB, Inc. Copyright 2015, IDG Consumer & SMB, Inc. All rights reserved. *PC World* and Consumer Watch are registered trademarks of International Data Group, Inc., and used under license by IDG Consumer & SMB, Inc. Published in the United States.

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ALONE.



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and most importantly, people like  
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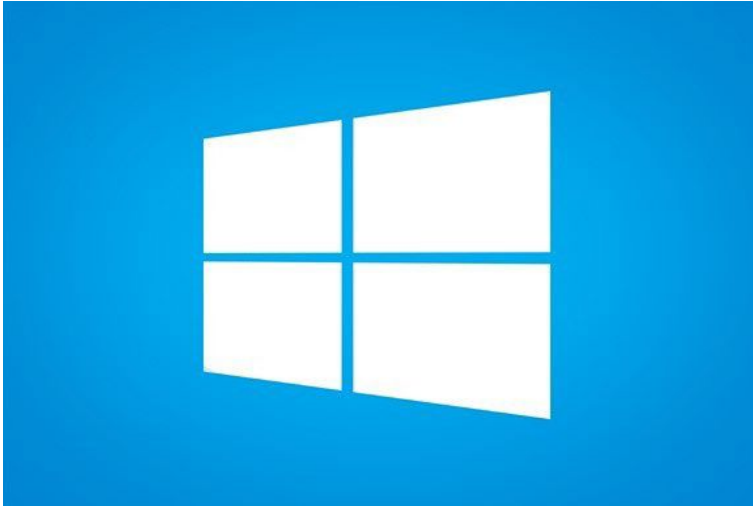


♥ CVS Health

# NEWS

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# Microsoft releases a Windows 10 'November update' with a smarter Cortana and more

Formerly known as “Threshold 2,” you could call this the first service pack for Windows 10.

BY MARK HACHMAN

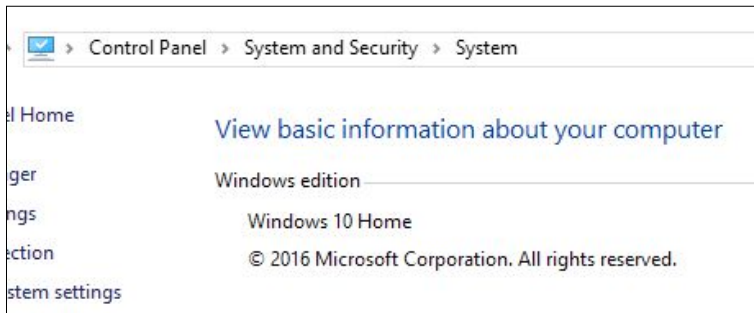
**WINDOWS 10 IS** actually pretty great. But Microsoft hasn't rested on its laurels: Better messaging, improved device activation, and media casting comprise several significant improvements within the first major patch to Windows 10 since its release in July.

A couple million users helped Microsoft evaluate Windows 10 before its launch. More than 110 million have already downloaded it since



then. With the release of the November Update, formerly known as “Threshold 2,” both groups are on the same footing:

Microsoft’s update takes many of these features out of preview and adds them to the “stable” build of Windows 10. And it’s not just the PC that’s receiving an update; Microsoft is launching the New Xbox One Experience (NXOE) ([go.pcworld.com/nxoe](http://go.pcworld.com/nxoe)) for its game console, too.



**Windows 10’s builds** are so advanced, they’re from the future.

Microsoft has released five previews since July. All but arguably the first two have added notable features while also fixing bugs (and introducing some, within the beta build environment) along the way. (Microsoft told us right before the launch that the latest beta build represents the “release candidate” for the update, essentially rolling up the previous builds into a public release.)

We’ve picked five improvements we think you’ll like most, based on what we’ve seen of them in the beta builds that Microsoft released before the launch.

**Why this matters:** We expect updates to patch bugs—and Microsoft has done so in subsequent patches since the public release. (One irritating example: Mail’s habit of suddenly disappearing, which now appears to be largely fixed.) But Microsoft’s November update release can also be thought of as propaganda: For all of the 110 million people who have upgraded to Windows 10, that’s less than 8 percent of the PC market, according to Net Applications. Think of releases like “Threshold 2” as the carrot to lure users to upgrade, with next year’s “recommended” upgrades to Windows 10 ([go.pcworld.com/w10adoption](http://go.pcworld.com/w10adoption)) as the stick.

## Cortana becomes your legal, entertainment assistant

I suspect that Microsoft's digital assistant, Cortana, isn't being utilized quite as much as Microsoft had hoped. Microsoft chief executive Satya Nadella recently said that Microsoft's 110 million users have only asked Cortana more than a billion questions—a big number, but it works out to roughly ten per user.

To help her become more popular, Microsoft has taught Cortana three new tricks: She tracks your movies and other ticketed events automatically, via your email; she can read “handwritten” notes via a Surface stylus; and you can now “Ask Cortana” for additional context within PDFs. Ticket tracking is a nice twist on the flight tracking capabilities that Google Now, Cortana, and Siri do, and Cortana's newfound ability to understand scrawled notes will be handy for those who use a Surface tablet frequently in an undocked mode. But highlighting a legal term in a court case or negotiation with a mortgage lender is especially convenient.

**Using Cortana**  
to define a legal or financial term can be really handy.

**FOR IMMEDIATE RELEASE:**

**NVIDIA Announces Financial Results for Third Quarter Fiscal 2016**

- Record revenue of \$1.305 billion, up 7 percent from a year ago, up 13 percent sequentially
- GAAP operating income of \$245 million, up 15 percent from a year ago
- Quarterly cash dividend raised 18 percent to \$0.115 per share. Company to return \$1 billion to shareholders in fiscal 2017

**SANTA CLARA, Calif. —Nov. 5, 2015**—NVIDIA (NASDAQ: NVDA) today reported record revenue for the third quarter ended October 25, 2015, of \$1.305 billion, up 7 percent from \$1.225 billion a year earlier, and up 13 percent from \$1.153 billion in the previous quarter.

GAAP earnings per diluted share for the quarter were \$0.44, up 42 percent from \$0.31 a year earlier and up from \$0.05 in the previous quarter. Non-GAAP earnings per diluted share were \$0.46, up 18 percent from \$0.39 a year earlier, and up 35 percent from \$0.34 in the previous quarter.


“Our record revenue highlights NVIDIA’s position at the center of forces that are reshaping our industry,” said Jen-Hsun Huang, co-founder and chief executive officer, NVIDIA. “Virtual reality, deep learning, cloud computing and autonomous driving are developing with incredible speed, and we are playing an important role in all of them.

“We continue to make great headway in our strategy of creating specialized visual computing platforms targeted at important growth markets. The opportunities ahead of us have never been more promising,” he said.

**Capital Returns**  
During the third quarter, NVIDIA paid \$53 million in cash [dividends](#) and received an additional 4.6 million shares at the close of the accelerated share repurchase agreement that it had entered into in the previous quarter. As a result, the company has returned an aggregate of \$604 million to shareholders in the first nine months of the fiscal year. The company intends to return \$800 million to shareholders in fiscal 2016.

For fiscal 2017, NVIDIA intends to return approximately \$1.0 billion to shareholders through ongoing quarterly cash dividends and share repurchases.

The company announced an 18 percent increase in its quarterly cash dividend to \$0.115 per share from \$0.0975 per share. NVIDIA will pay this next quarterly cash dividend on December 14, 2015, to all shareholders of record on November 25, 2015.



I've pulled together some info.

### Dividend

A dividend is a payment made by a corporation to its shareholders, usually as a distribution of profits. When a corporation earns a profit or surplus, it can re-invest it in the business (called retained earnings), and pay a fraction of this reinvestment as a dividend to shareholders.  
[en.wikipedia.org](http://en.wikipedia.org)

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### What is a dividend, divisor and quotient?

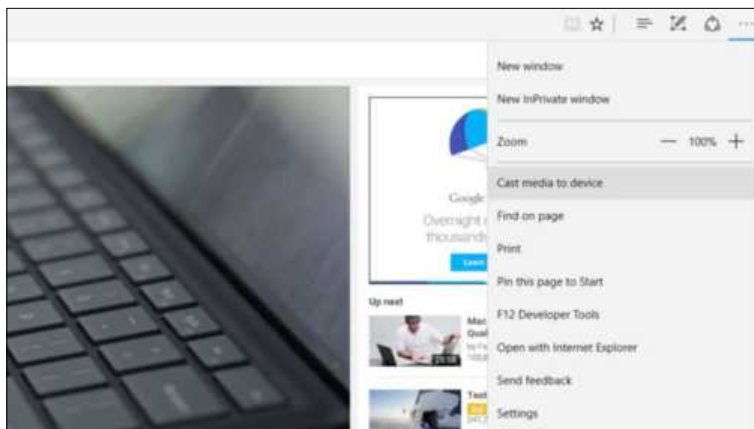
The dividend is the number being divided, the divisor is the number by which the dividend is divided, and the quotient is the result of the division.

Given  $a + b = c$ ,  $a$  is the dividend,  $b$  is the divisor and  $c$  is the quotient.

In long division:

## Microsoft's answer to the Chromecast

Microsoft originally dubbed this “media casting via Microsoft Edge,” and mentioned how Windows 10 can now cast to any Miracast or DLNA device connected on the same network. In reality, you probably won't know what devices on your network are compliant until you try to click the ellipsis menu on the upper left and select *Cast Media to Device*. In my house, they included the Xbox One as well as a Roku 3.



### Media casting

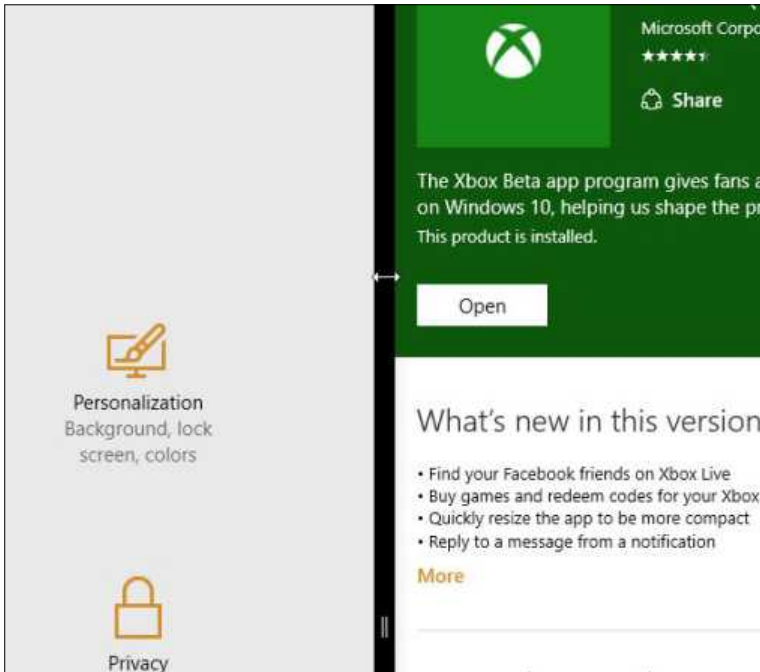
is a neat idea in the Windows 10 November update, but it may need a little work to buff out some of the bugs.

The idea is that Windows 10's Edge browser will allow you to stream YouTube videos, Facebook photos, and Pandora songs from your Edge browser to your other devices. Unfortunately, the preview software just didn't seem to work. I was able to push a YouTube video from a Surface 3 to the Xbox One just once, where it stalled after a second or two. And Edge asked for a PIN code from the Roku 3, which that box failed to provide. But for the Xbox One and Roku 3, there are already native YouTube apps that do a better job. (There may be other DLNA Miracast devices that lack native apps.)

I'd like to see this idea come to fruition, if only to provide the numerous Roku boxes out there with screencasting capabilities. Unfortunately, Google and its \$35 Chromecast already perform these functions with ease—and the Chromecast handles protected content; Microsoft says it doesn't.

## Snapped apps become even snappier

One of the joys of Windows 10 is Snap: Simply by holding the Windows key and an arrow key, you can quickly order a highlighted window into half or even a quarter of the screen. But if you want to fiddle with the alignment, you're forced to manually resize one window, then the other until everything's just so. A new toggle in the Settings app does away with this.



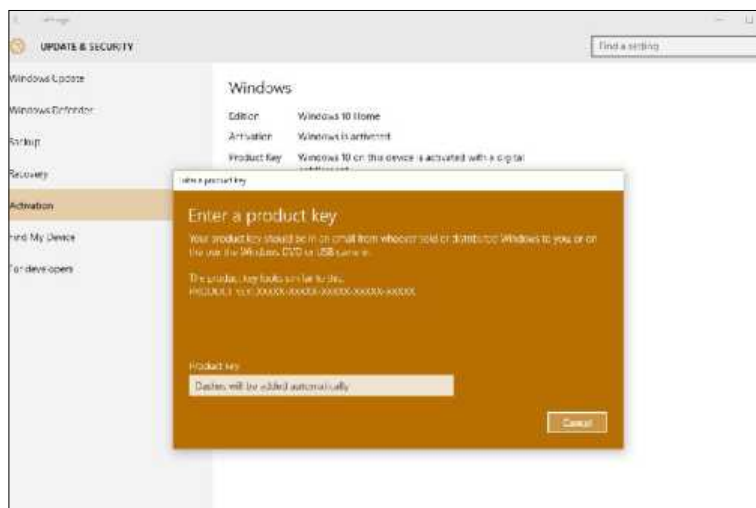
**With the November** update within Windows 10, you can go back and forth to get the snapped window width just so.

If you so choose, two windows snapped adjacent to one another can be adjusted by “grabbing” the border between the two and sliding the windows back and forth. Yes, that’s it: It’s an extremely subtle, simple, yet useful improvement.

Also, while in tablet mode, apps can now be snapped to the left and right. Apps can now be dismissed by swiping down—a feature that was originally part of Windows 8.

## Activation headaches (sort of) go away

Since the launch of Windows 10, the issue I've received the most questions about involves simply upgrading from Windows 7 or Windows 8 to Windows 10: is it going to erase all my files? What happens if I want to "nuke" the PC, and perform a clean install of Windows 10? A couple improvements have helped ease that pain.



**Windows 10's November** update offers you an opportunity to add a license key after it's installed.

Windows 10 hunts down your old license key within your PC and uses it to activate the installation. But if that doesn't work, you now have the option of entering the key either during or even after the installation (*Settings* > *Update & security* > *Activation*). If you do use a USB key to upgrade to Windows 10, Microsoft recommends that you remove the key as soon as the upgrade process begins, to avoid having to enter a product key. If you're too late, reboot.

Microsoft also said that it'll upgrade its Media Creation Tool ([go.pcworld.com/w10download](http://go.pcworld.com/w10download)) to simply provide a single Windows 10 image that will upgrade any 32-bit or 64-bit device, whether it be Home or Pro. The upshot is that this should help simplify the upgrade process for those who haven't begun it.



## A brighter messaging future

One trick I really like is Windows 10's newfound ability to send a SMS text directly from Cortana. But *how* she does it is what's really cool: Instead of tethering your phone via a cable or Bluetooth, the PC's Cortana looks for a Windows phone that you're logged into and automatically sends the text. It even pops up a notification on the phone alerting you that your text was sent.



**Today, you can** tell Cortana to "text" someone. Eventually, will you able to tell Cortana to "message" someone, and it will use either Skype or SMS?

It's the first step in the eventual integration of messaging directly into Windows 10. The new build should allow you to download a Messaging app, where you can carry on Skype conversations without the need to drop into the Skype app itself. The idea is that, on a Windows 10 phone, SMS and Skype and other messaging apps will all live within the same app. You can see a bit of this, too, with Mail's unified inbox.

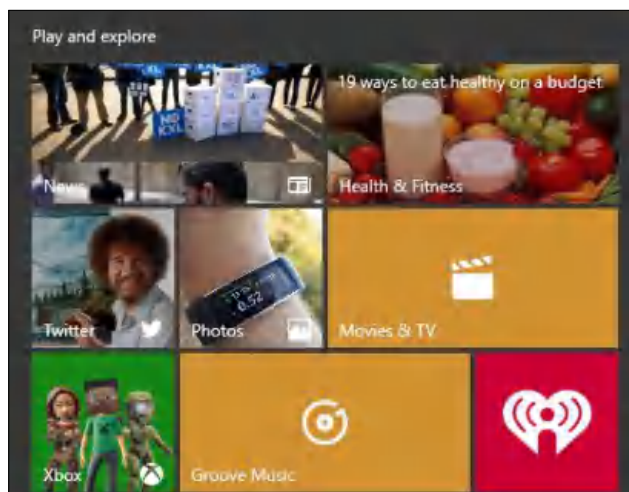
Unfortunately, my Windows phone (running a preview of Windows 10) didn't turn around and ping my PC when my father texted me back. We can hope this will be more fully fleshed out in the final build.

## The runners-up

Although we've spotlighted several of the top features, many more await you. Here's a brief rundown of the rest of them.

- The columns of Start tiles have expanded from three to four tiles across, while the number of tiles now supported by Windows 10 has increased to a whopping 2,048.
- A new Xbox beta app (not the Xbox app, but the Xbox Beta app) now includes a handy feature to find your Facebook friends who have Xbox Live gamertags. It's a fun way to connect with old friends who happen to use Xbox.
- A new feature (on by default) will alert you to any problems with USB-connected devices.
- Microsoft edge supposedly syncs Reading List entries and Favorites, although in my testing it didn't work within the preview builds.

Unfortunately, some of these features still have some kinks to work out—at least if the beta builds are any indication. Microsoft's bug bashers can't knock off yet. Nevertheless, Microsoft has addressed some of the complaints users have had with Windows 10—and rest assured, the patching and update process will continue. 🔌



**The wider Start menu.**

# Newly split-off HP Inc. begins life with a 4K laptop

BY AGAM SHAH



## HP ZBook

Studio has a 15.6-inch 4K screen.

**IT DIDN'T TAKE** long for the newly formed HP Inc. to release its first product, the ZBook Studio, a feature-packed, 15.6-inch laptop with a 4K screen.

The laptop can be configured to be as speedy as a gaming laptop, but is targeted at mobile workers.

The laptop marks the first product launched by HP Inc., which recently officially commenced operations after Hewlett-Packard split into two: HP Inc. and Hewlett-Packard Enterprise. More laptops, hybrids, and tablets are expected to be released by HP Inc. in the coming months.

The ZBook Studio is 18 millimeters thick and weighs 1.99 kilograms (4.6 pounds). It can be configured with Nvidia Quadro graphics cards, which are more for professional graphics and engineering applications.

The laptop has a 2TB storage capacity, but HP is selling a separate dock with a Thunderbolt 3 port, which will make it easy to add


external storage drives.

Beyond the Intel Core chips, the ZBook Studio is one of the few laptops that can be configured with a Xeon server-class chip. Starting at \$1,699, the laptop will ship in December.

A cheaper option would be HP's new ZBook 15u, which starts at \$1,099. It has a 1080p screen, up to 1.5TB of storage, and can be configured with an AMD FirePro graphics processor, which competes with Nvidia's Quadro.

A 4K screen can be included in HP's ZBook 15 and 17 laptops, which have 15.6-inch and 17.3-inch screens, respectively. The ZBook 15 has up to 3TB of storage, while the ZBook 17 offers up to 4TB of storage.

The laptops have up to 64GB of memory and can be configured with Intel Xeon or Core chips. The laptops are scheduled for release in January; prices weren't immediately available.

The products were announced at an event in New York City. 



**ZBook 15u**

# Google finally cutting off Chrome updates on Windows XP and Vista

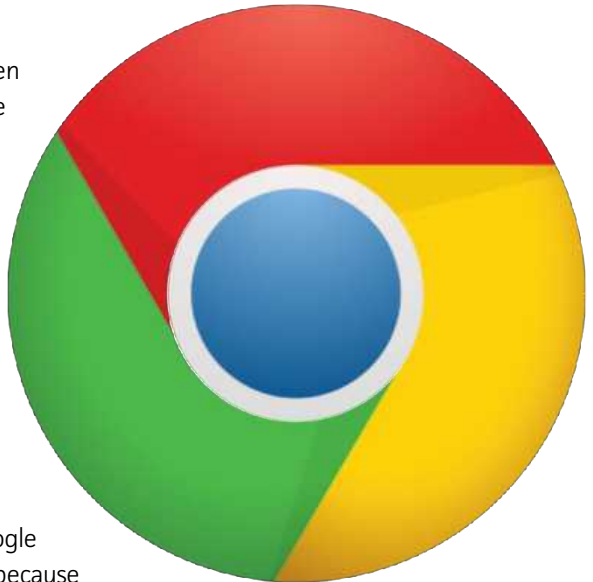
BY BLAIR HANLEY FRANK

**WINDOWS XP WILL** be getting even less secure next year, when Google stops updating Chrome for users of Microsoft's nearly geriatric operating system.

The company announced recently that PCs running XP and Vista will be able to keep using Chrome after April 2016, but Google will cease providing updates to its browser, including security-focused patches. That same deal goes for Mac users running OS 10.6, 10.7, and 10.8. Google said it was turning off the updates because the makers of all five OSs had stopped providing official support for them.

"Such older platforms are missing critical security updates and have a greater potential to be infected by viruses and malware," Chrome Director of Engineering Mark Pawliger said in a blog post announcing the decision.

Google said earlier this year that it planned to stop supporting old operating systems, and called out XP in particular as a problem. Microsoft's operating system, while more than a decade old, is still clinging to life on computers in homes and






organizations large and small. Microsoft ended support for XP last year ([go.pcworld.com/xptradein](http://go.pcworld.com/xptradein)), but some organizations (including the U.S. Navy [[go.pcworld.com/usnavyxp](http://go.pcworld.com/usnavyxp)]) haven't completely made the jump yet.

This is also bad news for people who want to keep old Intel Macs limping along with new versions of Chrome. Google didn't provide a version of its browser for older computers using PowerPC processors, which are stuck on OS 10.6.8, but other computers including the mid- and late-2006 editions of the iMac can't upgrade to a supported operating system.

It's a tough spot to be in, but come April, there won't be much of a choice for those people who want their old computer to still have a secure version of Chrome. Either they update their hardware, or they get left behind. 🔌

The browser will keep working, but users of unsupported operating systems won't get updates.



# Facebook will soon scan your smartphone to find photos of your friends

BY OSCAR RAYMUNDO

**PEOPLE ALREADY SHARE** a lot of photos online, but Facebook wants you to share even more photos stored on your smartphone.

Recently, BuzzFeed reported that Facebook is testing a new photo-sharing feature called Photo Magic that will scan your camera roll for photos of your friends. Photo Magic would then send you a notification of photos it finds of your Facebook friends and prompt you to send them via the Facebook Messenger app. According to BuzzFeed, 9.5 billion photos were sent within Messenger in the last month alone, so Photo Magic is Facebook's way of making it easier for users to share photos with their friends via a private platform.

In order to do this, Facebook's Messenger app will have permission to search the photos on your camera roll that haven't been uploaded yet and use facial-recognition technology to cross reference the photos with the profiles of your Facebook friends. Once Photo Magic finds a match, it will send you a push notification prompting you to instantly send the photo to your tagged friends.

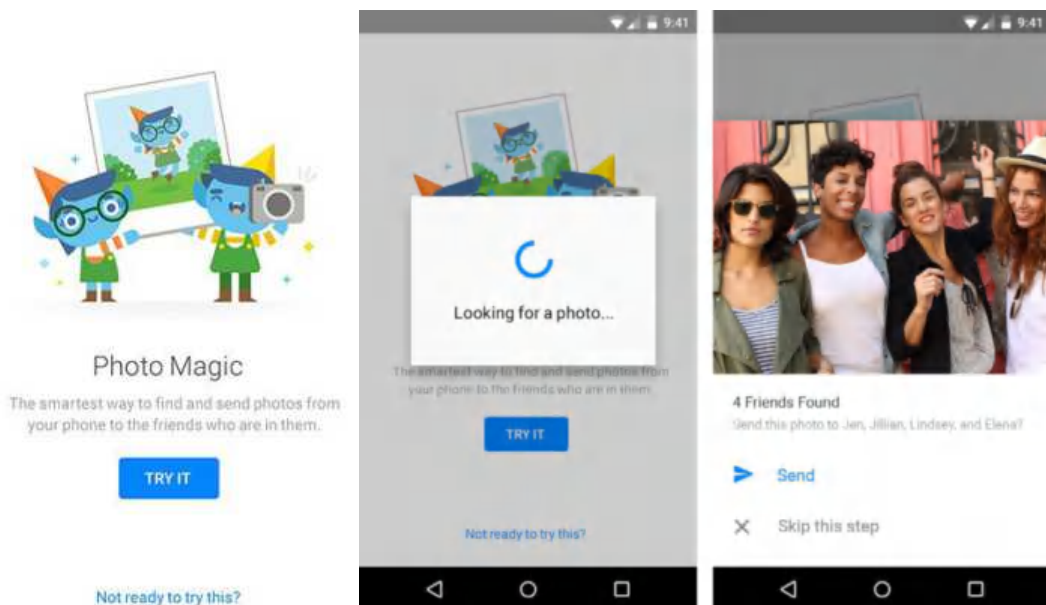


Photo Magic will let you send these photos directly from the notification screen and without having to open either the Facebook or the Messenger app.

According to BuzzFeed, Photo Magic won't send you a notification every time a photo of a friend is found, and Facebook is currently working on striking the right balance between being helpful and bombarding you with photo-sharing notifications. Facebook users also have the option to turn off Photo Magic notifications altogether.



Photo Magic is currently being rolled out only to Android users in Australia, but it will come to iOS users soon. On Android, Photo Magic scans your camera roll every time a new photo is taken. On iOS, photo-scanning will happen less frequently.

**The story behind the story:** Facebook has been tinkering with facial-recognition technology for some time. It's gotten so good, actually, that it can recognize users ([go.pcworld.com/fbrecognize](http://go.pcworld.com/fbrecognize)) even when their faces are hidden from view.

Facebook has already implemented some of this technology in its Moments app ([go.pcworld.com/fbprivatephotos](http://go.pcworld.com/fbprivatephotos)) for private photo-sharing (according to The Verge), Photo Magic was developed by Facebook's Messenger and Moments teams). Now it seems like Facebook is starting to experiment with using facial recognition more widely across its different apps. 🔌

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# The first affordable robot servant, Alpha2, is now in development

BY LINCOLN SPECTOR

**THE FANTASY OF** having your own benign, high-tech, vaguely humanoid robot servant goes back at least to Robby the Robot, the star of the 1956 science-fiction classic *Forbidden Planet*. Robby could cook, clean, carry several tons of cargo, and whip up anything from diamonds to booze from inside his body. He also followed Asimov's laws of robotics ([go.pcworld.com/3roboticslaws](http://go.pcworld.com/3roboticslaws)).

UBTECH Robotics ([ubtrobot.com](http://ubtrobot.com)) is taking one small step toward a



**Robbie the Robot**, from the 1956 film *Forbidden Planet*.

real Robby with their Alpha2 domestic robot, “the first ever designed for practical household service and companionship,” according to the company. UBTECH promises that the Alpha2 will talk, respond to verbal instructions, take pictures and send them to Facebook, protect your home, and even tell bedtime stories to your children.

The Alpha2 won’t be ready for the holidays. In fact, UBTECH has started a crowd-funding campaign on Indiegogo ([go.pcworld.com/alpha2](http://go.pcworld.com/alpha2)) to raise money for the Alpha2’s development. The company hopes to deliver the robot in the second quarter of 2016, with an anticipated asking price between \$1,500 and \$2,000. Early backers, however, will be able to pre-order one for just \$500.

Alpha2 looks mildly human and, I admit, thoroughly adorable. Twenty servos provide the joints that make it move. It’s small, being a little more than 17 inches tall and weighing about five pounds. Clearly, when it comes to household security, Alpha2 won’t have the same effect as an angry Doberman.

So how will it protect your home? According to UBTECH CEO James Chao, whom I interviewed via email, it can “activate the alarm once you leave your home.... It can also time the alarm to set once you go to bed. In addition, Alpha2 is noise activated so [it] will alert you if it hears unusual sounds.”

You may have noticed that both Chao and I are reluctant to give this anthropomorphized device a gender. That’s the owner’s prerogative. Users “will have options to select the voice of their



choice from the user manual.”

According to Chao, whatever voice you pick “provides you with a general companion feeling which phones and tablets cannot” match as you talk back and forth with the device. But will the voice sound like a real, emotional person? Chao says it can, but admits there’s room for improvement. “A big part of our campaign is attracting the developer community to assist in these areas.”

The Alpha2 will run on Android 4.4 (KitKat).

Clearly, the Alpha2 has a long way to go before it can match Robby. But it just might be an important step in the right direction—a step made by its own little feet. 🤖

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V I D E O G A M E V O T E R S . O R G

# Meet the first Toyota Mirai and the big, expensive plan to keep this hydrogen car alive

BY MELISSA RIOFRIO

**THE FIRST TOYOTA** Mirai to be sold in the United States might as well be the first car on Mars. It lands on a planet that can't easily support hydrogen fuel-cell vehicles. It's kept alive only by elaborate and expensive means. The car and its creator face huge odds yet remain determined to, as the hero of the recent movie *The Martian* put it, "science the shit out of this."

Toyota and its partners might as well be making a space station. A lot of science—and money—is going toward the fueling infrastructure for the Mirai. They're starting from zero, and it's all costly, complicated stuff: hydrogen production, ideally by cleaner means. Better distribution. Many more hydrogen stations.

The enormity of the mission hung over the small group that gathered November 9, at Roseville Toyota, north of Sacramento, to watch the first Mirai's excited owner get his key fob. Unlike hydrogen fuel-cell vehicles from Honda and Hyundai, which exist within tightly controlled lease



programs, the Toyota Mirai can be purchased outright (\$58,325 not counting federal and state incentives or other savings programs), or leased. It will eventually have to survive on its own, on whatever infrastructure it can find.

After the first Mirai drove away, I got to drive a second one, on a long loop through suburban streets and a bit of Highway 80. I hadn't seen the Mirai since I drove a prototype a year ago. With its dramatic swoops and creases, and its jowly front grille, it actually looks more space-agey than it did before.

Toyota might take a hint from the 2016 Chevy Volt and make future designs less quirky. On the other hand, there's no mistaking that you're driving a different kind of car.



**The 2016 Toyota Mirai's** exterior design includes dramatic swoops and creases, and a deep front grille.



**The distinctive** contours and creases of the 2016 Toyota Mirai telegraph “geeky.”

## The Mirai's mission: clean exhaust

The hydrogen fuel-cell payoff—the reason the Mirai just might be worth your investment—is clean energy, at least at the tailpipe end.

The Mirai is basically an electric vehicle that uses hydrogen fuel-cell technology to charge its battery. Hydrogen reacts within the fuel cell to produce electricity. This electricity charges the battery, which powers a motor that drives the car. Leftover hydrogen ions combine with oxygen to produce water, and that's the Mirai's only exhaust. (Toyota noted that the exhaust is distilled water and safe to drink, though flat-tasting.)



### Hydrogen engineer

Glenn Rambach is the first Mirai owner in the United States.

There are two main advantages of hydrogen fuel-cell over purely electric vehicles. For one, it takes just a few minutes to fill a hydrogen tank, while it takes much longer to charge electric vehicles, even at a supercharging electric station. Also, electricity's sources can often be heavily polluting power plants, while hydrogen production has the potential to be produced by cleaner means (right now it's mostly made with natural gas).

Not surprisingly, the first Toyota Mirai will be driven by a hydrogen



**The sole hydrogen station** in Northern California is at 1515 S. River Road in West Sacramento. More stations will open in the coming months.



engineer. Glenn Rambach, who just turned 70, actually worked on the space program, and remembers when General Electric started developing fuel-cell technology to power long-duration space flights. Now Rambach's working to develop hydrogen fueling stations.

Rambach immediately experienced the need for more fuel resources. As he prepared to drive away in his new Mirai, he realized he had only a half-tank of hydrogen. Roseville Toyota will have a mobile fueling station at its site starting next week, but for now, the salesperson could only shrug helplessly.

The Mirai's lifeline—the only active retail station in Northern California as of this writing—is over 20 miles away from Roseville Toyota, at 1515 S. River Road in West Sacramento. I'm writing out the address because it's hard to find: tucked into a corner of a petroleum storage facility in an industrial part of town. This isn't somewhere Rambach will stop on the way to the grocery store; this will be a planned and essential trip.

Rambach described how the fueling technology, which uses valve ports that plug into each other, is "smart." The car can tell the station how much fuel it has and how much more it needs, so it can't be overfilled.

The Mirai's range is about 300 miles on its 5kg fuel capacity (divided between two tanks). Therefore, Rambach can't drive more than 150 miles from this station, until more of them come online. The station map ([cafc.org/stationmap](http://cafc.org/stationmap)) posted by the California Fuel Cell Partnership shows an ambitious plan to string outposts from Sacramento to Los Angeles. It's ambitious because it's a huge investment: Each station costs \$1 million to \$3 million to build, compared to \$10,000 or so to build a Level 2 charging station for an electric vehicle.

On top of the station cost, the science of hydrogen production needs to evolve. According to Rambach, currently 95 percent of hydrogen fuel is made from natural gas, which is combined with steam to produce methane. Efforts to produce it using methane captured from cows or waste management facilities are still in the experimental phase. The fuel will also need to be trucked in, just like regular gasoline.

According to Rambach, hydrogen stations are being built with future advances already in mind. "The big picture," Rambach said, "is for hydrogen stations to be self-contained—to make their own hydrogen



### **The 2016**

Toyota Mirai's fueling valve sits behind a little door on its left side.



**This is the sole** retail hydrogen station open in Northern California. Take a close look at the meter on the pump: Currently, the hydrogen costs \$13.59/kg.

onsite.” For example, a station he’s helping to develop in Rohnert Park, California, is designed so it’ll someday be able to use solar or geyser power to make hydrogen fuel.

## The cars need fuel stations, and vice versa

Right now, Rambach and everyone else are laser-focused on getting stations online. Station availability will encourage car sales, and car sales will create new customers for the stations. “The cost of the station is the cost of sales,” Rambach said. “The enabler for those sales is the station.”

Currently the fuel is expensive—\$13.59 per kilogram at the West Sacramento station, which equates to almost \$70 for filling the Mirai’s 5kg capacity. While it’s likely the cost of fuel will drop as production ramps up, Toyota is giving Mirai owners three years’ worth of free fuel, up to \$15,000. That’s just one of many perks ([go.pcworld.com/mirai perks](https://go.pcworld.com/mirai perks)) designed to offset the challenges of being a Mirai early adopter.

Keeping Mirai customers happy is job one for Judy Cunningham, the manager leading Mirai sales for Roseville

Toyota. For her, it's all about the fueling stations. "The car is a given," she said, "but the main component is infrastructure."

The dealership's getting a mobile fueling station, subsidized by Toyota, which will be free and available at least through the summer of 2016. Roseville Toyota isn't stopping there, though: Cunningham noted that the dealership owner is hoping to develop a gas and hydrogen station on land he owns in Rockland, California.

Cunningham acknowledged that her first 10 "VIP" Mirai customers are enthusiasts like Rambach. They're willing to put up with some inconvenience to have one of the first of these cars—and will talk it up to everyone they know. The 700 Mirais allotted to California are already sold out, but Cunningham's building a waiting list for the next shipment, which is expected by the summer of 2016. Cunningham said all the current Mirais are hand-built in Japan at the agonizing rate of just three a day, but Toyota is opening an automated plant for them in the near future.

As we prepared to take out the display model Mirai, it reminded us yet again why it's different: We started the car inside the dealership. Inside. A few hairstyles may frizz from the humidity, but there's no risk of asphyxiation from the water exhaust.



**The Toyota Mirai's** electric motor is tucked way down inside the front compartment, while the fuel cells are underneath the front seats.

**The 2016****Toyota Mirai**

can drive up to 300 miles on a 5kg tank of hydrogen fuel.



Driving the Mirai was similar to driving the Prius, but even quieter, because there's no gas motor of any kind. The car is very heavy—its curb weight is 4,078 pounds—but at street speeds, the car runs smoothly and feels peppy. The Mirai emits a slightly annoying whine that unfortunately gets a little louder when you accelerate. Its 0-to-60 time is a modest nine seconds, but I felt reasonably capable when merging and changing lanes on the freeway. The regenerative brakes feel a little doughy when you press them, but not in an alarming way. I'd call this car pleasant, rather than powerful, but power is obviously not the Mirai's priority.

Now that the first Mirai is on the road, it's a race to see whether additional stations can go up fast enough to give the second, third, and further Mirais room to spread out. Glenn Rambach's looking forward to December, when a new hydrogen station scheduled to open in Truckee will let him take the Mirai to the ski slopes. You can evangelize this car only as far as you can drive it—literally—and everyone involved knows that. All they can do is take it one station at a time. 🔌

Make smart purchases,  
stay safe online.

# CONSUMER WATCH

## Online ad industry, battling ad blockers, admits it messed up

The Internet Advertising Bureau is calling for better practices to stop alienating Web users.

BY JEREMY KIRK



**F**ROM ONE PERSPECTIVE, it could be argued that the online advertising industry is getting what it deserves. After years of having webpages stuffed with ads, surfers are increasingly blocking them with free tools.

The other perspective is that ads, like them or not, pay people to create content, which other people like on the web. Since finding paying subscribers is hard, ads are a key source of online revenue

for publishers.

In a frank post on recently, a senior executive of the largest online advertising trade group admitted that the surge in online ads over the years—and the accompanying performance issues—have alienated many.

“We messed up,” wrote Scott Cunningham, senior vice president of technology of the Internet Advertising Bureau and general manager of its Tech Lab. “As technologists tasked with delivering content and services to users, we lost track of the user experience.”

The IAB is composed of 650 organizations that serve some 86 percent of online advertisements.

An effect of the ads has been the increasing use of tools such as Adblock Plus, which blocks advertisements from being served by known ad servers.

A report ([go.pcworld.com/adblockingreport](http://go.pcworld.com/adblockingreport)) released in August forecasted that U.S. websites will lose US\$21.8 billion in ad revenue this year due to ad blockers. Use of ad-blocking tools rose 48 percent in the United States in the last year to around 45 million users.

Across Europe, the report said 77 million people are using ad blockers, a 35 percent increase in the past year.

The report was written by PageFair, an Irish company which helps websites count users who block ads, and Adobe Systems.

Cunningham acknowledged that the industry’s practices over the years have been in part responsible for the shift.

“We were so clever and so good at it that we over-engineered the capabilities of the plumbing laid down by, well, ourselves,” Cunningham wrote. “This steamrolled the users, depleted their devices and tried their patience.”

Across Europe,  
the report said 77  
million people are  
using ad blockers, a  
35 percent increase  
in the past year.




To encourage better practices, the IAB's Tech Lab is starting a new program called the L.E.A.N. Ads, which stands for Light, Encrypted, Ad choice supported and Non-invasive ads, Cunningham wrote.

The program is designed to guide future online advertising standards and best practices. Cunningham wrote it will address issues such as retargeting, a practice where a targeted ad is shown to people when they're on other websites. He wrote that people should not be retargeted after they've made a purchase.

Also, the online ad industry should address the volume of ads that are on a webpage and viewability, a term for determining if a person has actually seen an ad that was served to a webpage.

The IAB has also been encouraging ([go.pcworld.com/adencryption](http://go.pcworld.com/adencryption)) advertising companies to deliver ads using encryption, which can help reduce the problems of malicious ads popping up on webpages that try to attack users' computers, known as *malvertising*.

There is a sense of urgency to the IAB's plan as people increasingly use mobile devices to browse the web. PageFair and Adobe's report said that ad blocking tools aren't widely used yet on mobiles, but that could become more common.

Apple, for example, now allows the use of ad blocking software in iOS 9. Within days of the new OS's release, several ad-blocking tools were widely downloaded. 

You might know **Joshua**.  
He loves video games, and he  
owns enough to know they're not  
all meant for kids. That's why he  
reminds his friends (at least the  
ones that have kids) that they all  
have **big black letters on the box**  
to help parents find the ones that  
are best for their families.

You can learn about those  
ratings at **ESRB.org**



Los Angeles, CA



ENTERTAINMENT SOFTWARE  
RATING BOARD



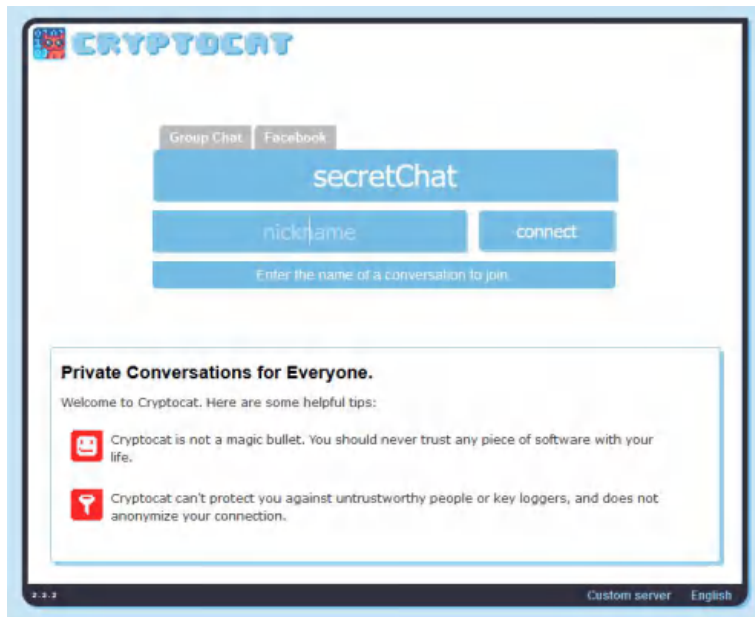


# Three desktop tools for ultra-private encrypted chats

BY IAN PAUL

**MANY PEOPLE LIKE** the idea of increasing their privacy with encryption and anonymity tools for sharing files, web browsing, and messaging. The trouble is finding tools for the job that aren't overly complex.

This tip will take a look at how easily you can use current privacy tools to chat with your friends in privacy and security.



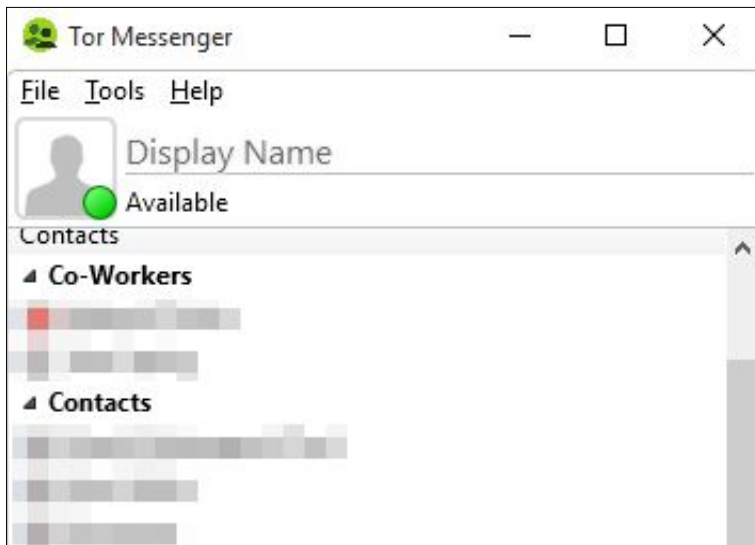
## Cryptocat

**Advantages:** Browser-based, encrypted chat; no user account required.

The easiest tool to use for encrypted online chat is Cryptocat ([crypto.cat](http://crypto.cat)) by developer Nadim Kobeissi. First you have to install the add-on for Chrome, Firefox, Safari, Opera—there are also apps for OS X and the iPhone.

Next, just click on the add-on icon in your browser, which will open a new tab with an interface similar to the one you see here. Fill out that form with the conversation name, the nickname you want, and hit connect.

Next, your encrypted chat tab will appear. Now you can just share the name of your conversation with others, and they can use that information to join your covert online meeting.



## Tor Messenger

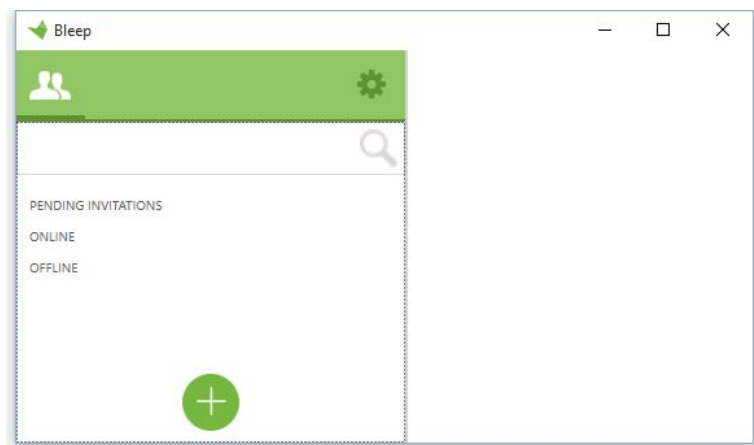
**Advantages:** Desktop only; Encrypted chat option; anonymity; works with pre-existing chat services.

The Tor project recently released a beta version of a traditional desktop instant messenger called Tor Messenger ([go.pcworld.com/tormessenger](http://go.pcworld.com/tormessenger)), based on the Instantbird project. Tor's version features Off-the-Record (OTR) encrypted messaging and, because it uses the Tor network, provides a reasonable amount of anonymity as well. To take advantage of OTR, the person you're chatting also needs an OTR-enabled chat client.

Tor Messenger integrates with a number of existing chat services, including Google Talk, Facebook Chat (not working at this writing), and Yahoo. The program also works with Twitter, IRC, and generic XMPP.

*Note: At this writing, the beta had a minor bug in it that caused the program to crash in Windows 10. Advanced users can fix the bug on their own with the workaround on this thread ([go.pcworld.com/win10torbug](http://go.pcworld.com/win10torbug)). Otherwise we expect a fix to be made public soon.*

## BitTorrent Bleep



**Advantages:** Encrypted chat; not server-client based; desktop and mobile; no user account required.

Like Tor Messenger, Bleep ([bleep.pm](http://bleep.pm)) is also a desktop client but it doesn't work with existing chat clients. Bleep depends on the BitTorrent protocol to share messages, and it functions as its own chat service.

To connect with friends on Bleep, click Settings → Be Added By Friends and share your public key with them. To add a friend using their public key click the + icon at the bottom of the screen, paste their public key on the next screen, and then click Add Contact.

Bleep is probably the most complex of the three programs, but once you get the hang of it, it's really not that hard.

Whether you prefer to chat using the browser or a desktop app, or if you absolutely must use Google Talk, one of these programs should suit your needs to keep your conversations private. 🔒

# F-Secure's Sense antivirus hardware protects every device in your home, from PCs to TVs

BY JARED NEWMAN

**F-SECURE IS TAKING** an unconventional approach to virus protection with a hardware box that covers every device in your house.

For \$199, the F-Secure Sense ([sense.f-secure.com](http://sense.f-secure.com)) connects to any wireless router and creates its own secure network. It then analyzes the traffic coming to or from any device on that network, finding and blocking potential threats.

Sense's main advantage over standard antivirus software is the protection it offers for smart TVs, connected appliances, or other smart home products. The makers of these products have a long history of neglecting security risks ([go.pcworld.com/iotsecurityrisk](http://go.pcworld.com/iotsecurityrisk)), so F-Secure is promising to recognize and stop common threats. The company also says it can block unwanted tracking and data collection. Here's how tracking protection works, according to F-Secure: "Sense will recognize suspicious traffic (for example, if your TV is uploading huge amounts of data to an unknown site) and notify the user through the app, and/or automatically block the traffic (depending on the nature of the traffic and user settings)."





As for computers and mobile devices, F-Secure Sense can protect them automatically at home, though users won't get the same protection outside the house unless they install the Sense app. That app also allows users to keep an eye on how many devices are connected and any threats that have been blocked.

Overall, the product sounds a lot like Bitdefender's Box ([go.pcworld.com/bitdefenderbox](https://go.pcworld.com/bitdefenderbox)), and has a similar pricing scheme. The hardware will cost \$199 when it launches next spring—with pre-orders available now—and will include 12 months of protection. After that, the subscription price becomes \$8 per month.

**Why this matters:** In a perfect world, this level of protection would be built into the smart devices themselves, or perhaps into a smarter type ([go.pcworld.com/onhub](https://go.pcworld.com/onhub)) of wireless router. F-Secure's hardware could be a useful stopgap if it works as advertised and doesn't put too much strain on network performance. 🔌

**F-Secure's Sense** hardware can also protect devices that traditionally lack discrete security options, like smart TVs, game consoles, and connected home devices.





# This website helps you find cheap items to get free Amazon shipping

BY IAN PAUL

**HERE'S A TIP** you'll want to keep in mind if you've got any plans to visit Amazon anytime soon. The online retailer is a great place to shop, but it's easy to fall short of the site's \$35 free-shipping requirement. The choice between spending another two bucks or forking over more for full-cost shipping is a no-brainer.

The company tries to assist with some suggestions, but if you're looking for an alternative, check out Amazon Filler Item Finder ([filleritem.com](http://filleritem.com)), which surfaced on Reddit recently.


This site is very basic and simple to use.

At the top, you just enter the amount that you're short and Filler

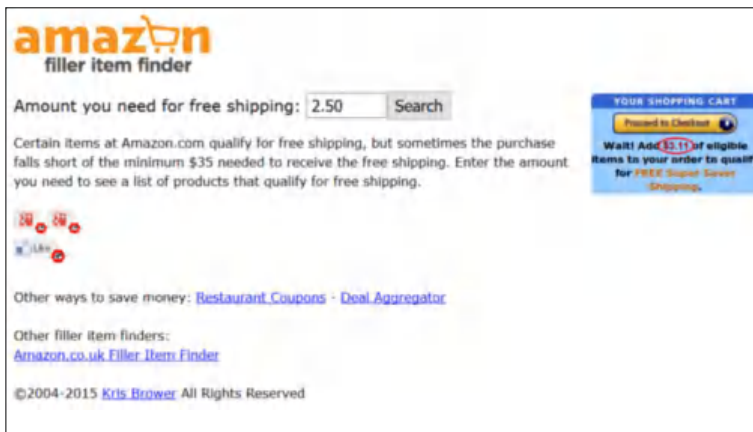
Item Finder creates a text-based list of all the items within that price range. Say you're short by \$2.50, Filler Item Finder will show you items starting at \$2.50 and up. To make it easier to find something, items listed with bold font are popular products, while very popular products also have a picture added.

You should be able to find an item that is somewhat useful, rather than simply tossing random crap into your cart to meet the free shipping requirements.

Once you've decided on an item, click on it, and you'll be taken to Amazon where you can add it to your cart.

The site is ad-free, but presumably site creator Kris Brower makes money via Amazon affiliate links. Currently, there are versions of Filler Item Finder for the U.S. and U.K. stores. 


### Amazon Filler Item Finder.



**amazon**  
filler item finder

Amount you need for free shipping:

Certain items at Amazon.com qualify for free shipping, but sometimes the purchase falls short of the minimum \$35 needed to receive the free shipping. Enter the amount you need to see a list of products that qualify for free shipping.



Other ways to save money: [Restaurant Coupons](#) - [Deal Aggregator](#)

Other filler item finders:  
[Amazon.co.uk Filler Item Finder](#)

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# REVIEWS & RATINGS

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## 5 things I noticed in my first hours with the iPad Pro

Our iPad Pro was just delivered, and while we're still working on the review, a few things became immediately clear.

BY SUSIE OCHS

**THE IPAD PRO** is not something you can review in a couple of days. That's not because it's a new product category or even a dramatic reimagining of one—we've all used iPads by now, and more or less

understand what kinds of tasks they can do and apps they can run. If anything, the iPad Pro ([apple.com/ipad-pro](https://apple.com/ipad-pro)) represents a shift in workflow. The trick isn't what the iPad Pro can do, but how it allows you to do more with an iPad than you're doing already.

I'll be giving myself a little time to write Macworld's iPad Pro review, since it'll take some time to adjust to the iPad and evaluate what benefits and drawbacks it offers over my Mac.

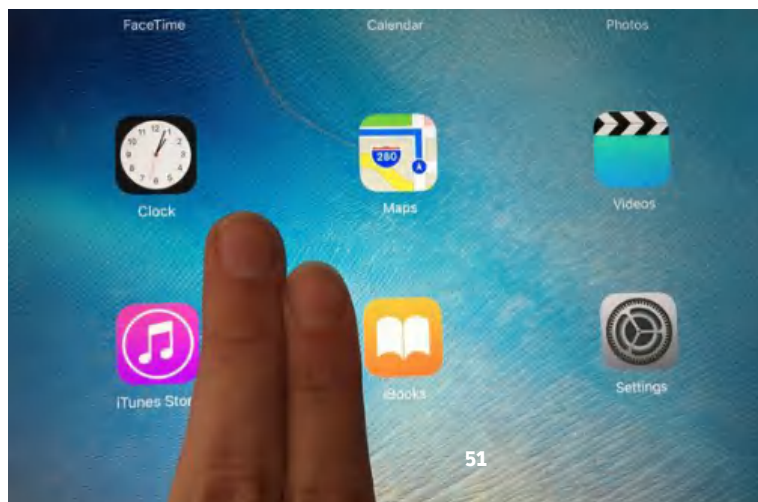
But from the moment I ripped off the shrink wrap and fired it up, I noticed a few things I wanted to share. Here are the five most striking impressions the iPad Pro made on me in the first couple of hours.

## 1. So much wasted screen space

Apple should really take this opportunity to rethink the classic "grid of square icons" we've had since the very first iPhone launched in 2007.

My iPad Pro came with 32 apps preinstalled: four in the home row, 16 more on the first page, and 12 more on the second. The icons are huge, bigger than my own thumbnail, and they're spaced so wide that my index and middle fingers can fit comfortably between each one. In portrait mode, the iPad Pro screen can show five rows of four icons, plus the home row. In landscape mode, four rows of five icons. The home row can still expand to up to 6 icons, but it wouldn't feel

**Enough space**  
between home  
screen icons for  
two fingers.





crowded with more, assuming the icons could shrink a little.

When the iPhone got a bigger screen, we got a choice: The iPhone 6, 6 Plus, 6s, and 6s Plus all have two display modes. Zoomed mode enlarges everything, including type and icons, while Standard mode keeps the icons the same size as your older, smaller iPhone, meaning you have space for an additional row of icons on your home screen. It makes zero sense to me that my 4.7-inch iPhone 6s can have six rows of four icons in portrait mode (aside from the home row), while the 12.9-inch iPad Pro can only have five rows of four icons.

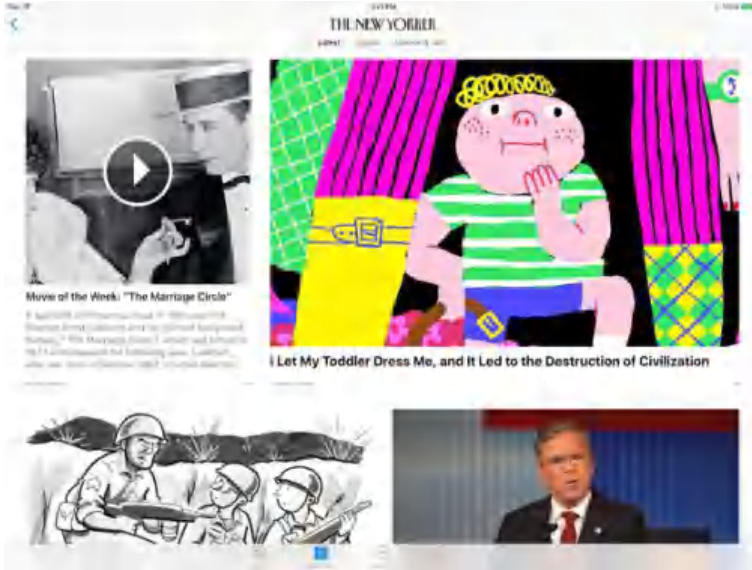
I think Apple should consider reimagining the iOS app grid—I like how Android does it, personally, but if we aren't comfortable admitting that out loud, let's say the new layout could be more Mac-like rather than more like Android. Let me put my most-wanted apps and folders (and dare I say widgets?) on the home screen, arrange them however I like, and keep everything else stuck in a drawer that can expand with a tap or swipe.



**My iPhone's** home screen has room for four more icons than the iPad Pro's home screen does. That's just weird.

## 2. So much beautiful screen space!

Still, no iPad user spends much time gazing at the home screen. iPads are for apps, and once I opened an app, I was so glad to have the extra inches of screen real estate. Apps like Mail, Maps, News, Calendar, Photos, FaceTime—heck even the App Store—all benefit from the extra elbow room.



**The News** app looks particularly great on the huge iPad Pro screen. I'm still not a fan of reading it on the iPhone.

My usual iPad is an iPad mini, because I work on a MacBook Air and tackle away-from-keyboard stuff on my iPhone whenever possible. The iPad mini is just a fun “bonus” device, for gaming, shopping online, and watching video. So I was initially a little skeptical that I would find a faster iPad with a bigger screen that much more compelling, but even using the software keyboard that gobbles up a third of the screen leaves plenty of room for my content. Like many other reviewers before me, I’m planning to use this as my main work machine during the review period, and it was immediately clear that I’ll find it so much easier to get things done, even viewing one app at a time.



**That's my white** iPad mini 2 (inside a rugged case, no less) on top of the space gray iPad Pro. Double the screen space is nothing to sniff at!

### 3. Best software keyboard ever

At first I was salty that the Smart Keyboard I ordered with my iPad Pro wouldn't ship for another week. (Apple is sending us a loaner unit tomorrow, so I won't actually have to wait that long, and yes, I know what a privilege that is.) But this software keyboard is the best I've ever used, so I'll be able to struggle through without much struggle at all.

Like a good digital citizen, I use complex passwords full of letters, numbers, and symbols, even though that kind of password is harder to enter on my iPhone, requiring me to jump between the keyboards for letters, numbers, and symbols in a way I just don't have to on my Mac. The iPad Pro's software keyboard has a row of numbers and common symbols along the top of the letter layout, just like the Mac. Shortcuts even pop up per application—in Mail, the options to insert a photo or attach a file are handy to have right onscreen without any tap-and-hold tricks required to find them.

But speaking of tricks, the two-finger trick in iOS 9, turning the keyboard into a trackpad for easier letter insertion, is easier here than on the iPad Air, since the cursor is bigger and easier to see. I also like tapping-and-holding on the keyboard-switching Globe icon to find the toggles for the emoji keyboard and predictive text option. (This menu will also show you all the third-party keyboards you have installed.)

**I love how** the keyboard has enough space to pack in extra functionality without having to switch views so often.

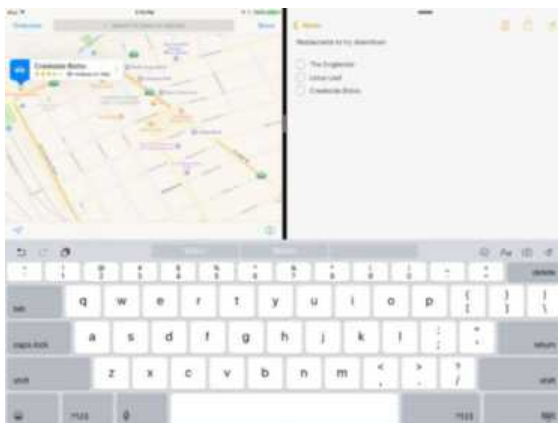


I even tried touch-typing in landscape mode, and found it surprisingly possible. Keeping my fingers on the home row of keys (ASDF and JKL;), I was able to type without looking at the keys, with fewer errors than I thought, thanks to auto-correct. It felt weird tapping on the screen with no feedback, but it was possible. If Apple can someday upgrade the software keyboard with Taptic Engine haptic feedback, this will be even easier.

#### 4. Split View is my jam

I never tried seriously to use my iPad as my work machine for a couple reasons: My job's content management system didn't work so well in Mobile Safari and required a VPN, and I almost never work in one app at a time. Writing an article for Macworld can take several apps: Byword for composing, editing photos in Pixelmator, looking up facts and links in Safari, not to mention producing and publishing the article there. While I can use all those apps on an iPad, juggling them wasn't fun, and felt like it was slowing me down.

iOS 9's multitasking features, Split View, Slide Over, and Picture in Picture, all work on the iPad Air 2 and iPad mini 4, but they feel so much more at home on the iPad Pro. Running Byword and Safari side by side, I have about the same space in each than I had on my iPad mini's entire screen. And there's no delay in pulling out the Slide Out drawer, or expanding a Slide Out app's view to full Split Screen. Even Picture in Picture makes more sense here—Mail on the iPad Pro has enough free space for me to stash a smallish Netflix window without covering up too much.



## 5. It's not a hybrid. It's still an iPad.

Like I said, I'll be spending some time using the iPad Pro as my main computing device, avoiding my trusty MacBook Air whenever possible. That means I'll be using the iPad Pro quite a bit while sitting at a desk—not my usual location for iPad computing. Because Windows 10 is designed to run on both tablets and laptops, our friends at PCWorld get to sample plenty of devices that are meant to straddle the line, hybrids that can act as laptops or tablets depending on how you swivel the screen or snap off a keyboard.



**The iPad Pro** makes my 13-inch MacBook Air look almost small. But will it deliver as much productivity? I can't wait to find out.

The iPad Pro is still an iPad all the way, whether I've got it propped up on my desk with a Bluetooth keyboard paired, or I'm sitting back with it on the couch, tapping out this article on the software keyboard. Aside from keyboard support, which every iPad has, it isn't trying to be one machine on my desk and another on my lap. It's an iPad through and through—just a really big, really fast iPad that might fix the pain points I had with working from a tablet...or might not. Look for the full review coming soon. 🔌

# How many light bulbs does it take to change an American?



It's no joke: climate change is a critical issue for all life on Earth. But can the actions of one individual really make a difference? Visit [nature.org](http://nature.org) to calculate your impact on the world around you and learn about steps you can take to make the world a better place for us all.

[nature.org/calculate](http://nature.org/calculate)

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Conservancy   
Protecting nature. Preserving life.™

# Linksys WRT1900ACS: The best router for most router enthusiasts

BY MICHAEL BROWN



In April 2014, the Linksys WRT1900AC was the fastest 802.11ac router I'd ever tested ([go.pcworld.com/linksyswrt](http://go.pcworld.com/linksyswrt)). And I made a point of including that date in the "At a Glance" part of the review for two reasons: That information is displayed almost as prominently as the headline in our reviews, and the router market was moving crazy-fast back then. It still is.

The latest version of that router—the WRT1900ACS, reviewed here ([linksys.com/WRT1900ACS](http://linksys.com/WRT1900ACS))—is an incremental improvement, having gained a speedier CPU (running at 1.6GHz, versus 1.2GHz in the original) and another 256MB of DDR3 memory (512MB in total, compared to 256MB in the original). One change I'm not as enthusiastic about is the trading of an inline power supply for a large, outlet-hogging wall wart. The new model also loses the unique cooling fan, but it never seemed to spin up anyway, so that's not a big deal.

As you can tell by the model number, this is an AC1900 router, delivering theoretical throughput of 600Mbps on the 2.4GHz frequency band (serving 802.11n clients) and theoretical throughput of 1300Mbps on the 5GHz band (serving 802.11ac clients).

It remains a 3x3 device with four antennas, a so-far unique arrangement in which the router determines which three antennas will deliver the optimal range and performance and then dynamically switches among them. Like the original, the WRT1900ACS is outfitted with one eSATA/USB 2.0 combo port and one USB 3.0 port. These let you share both storage and a printer over your network.

All the changes are under the hood. Linksys wisely didn't monkey with the design aesthetic.

## Linksys WRT1900ACS

### AT A GLANCE

Routers that can operate three independent networks remain the best choice for people with very crowded wireless environments, but the WRT1900ACS is a solid choice for most enthusiasts.

### PROS

- Fast wireless performance
- Very fast storage performance
- Great industrial design

### CONS

- Supports only three spatial streams
- Dual-band (versus so-called tri-band)
- Definitely looks like a router (that will be a Pro for some)

\$230

★★★★★



In addition to its performance, a large measure of the original WRT1900AC's appeal stemmed from two things: First, its decidedly retro industrial design and stackable nature (Linksys offers a similarly designed 8-port gigabit switch that can be placed underneath the router—in multiples, I suppose, if you need more than eight ports. A companion NAS box ([go.pcworld.com/wrtcompanion](http://go.pcworld.com/wrtcompanion)) was planned, but later cancelled.). Second, its friendliness toward the open-source community.

The router has been supremely reliable, even though my home-run closet tends to get a little warm.

While the reality took much longer than anyone expected to catch up to the hype, you can now download and install alternative firmware ([go.pcworld.com/altwrtfirmware](http://go.pcworld.com/altwrtfirmware)) on the WRT1900AC that looks and performs very differently from what Linksys has wrought. It's not something I'd recommend to the casual user, but it's available if you want to take the plunge. The new model retains that characteristic.

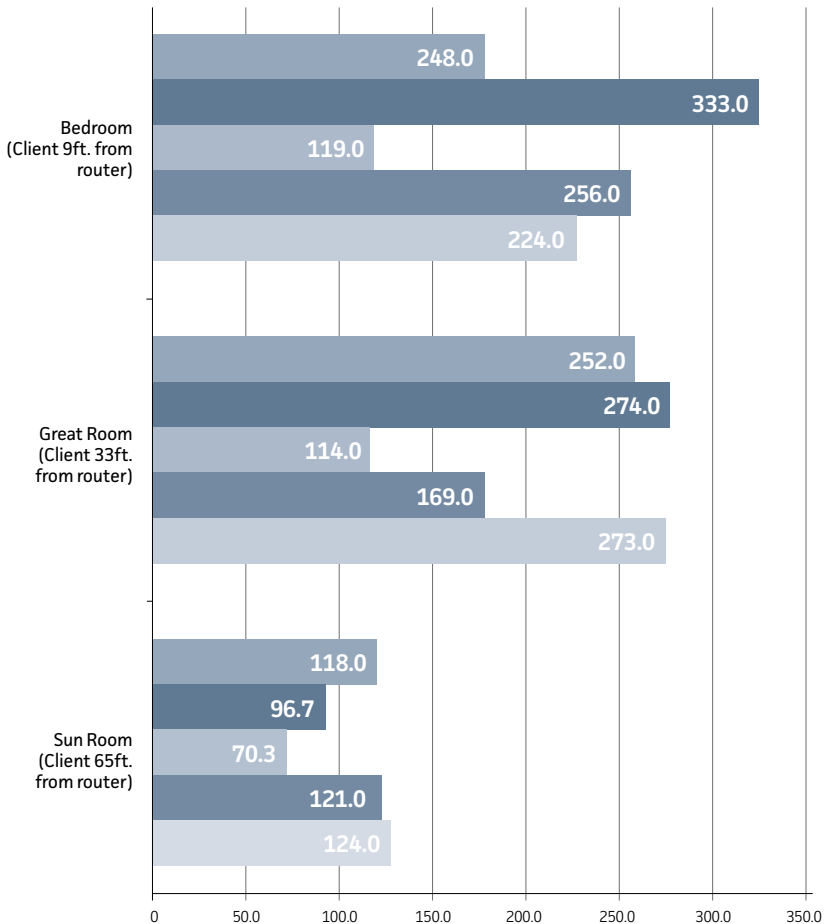
## 5GHz 802.11n performance

I compared the WRT1900AC's performance to a diverse range of mid-range and high-end competitors, as well as the original WRT1900AC. Both the more-expensive Asus RT-AC3200U (\$280 street) and the cheaper Netgear R6400 ([go.pcworld.com/netgearR6400](http://go.pcworld.com/netgearR6400)) outperformed the new Linksys when serving a 5GHz 802.11n client. The Asus is capable of running three Wi-Fi networks (one on the 2.4GHz band, one using low channels on the 5GHz band, and a third using high channels within the 5GHz band). If your environment is crowded with lots of bandwidth-hungry wireless devices, an AC3200 router such as this is probably a better choice.

The Netgear R6400 is a dual-band AC1750 router that can deliver throughput of up to 450Mbps on the 2.4GHz band and up to 1300Mbps on the 5GHz band. It didn't beat the new Linksys by much, but it's a strong value with a \$150 street price. The Google/TP-Link OnHub ([go.pcworld.com/tplinkonhub](http://go.pcworld.com/tplinkonhub)) is also an AC1900 router, but it trailed the field on this benchmark by a wide margin.

## 5GH 802.11ac Performance, Channel 153

Paired with a 3x3 Intel Centrino Ultimate-N 6300 Wi-Fi adapter



MEGABITS PER SECOND



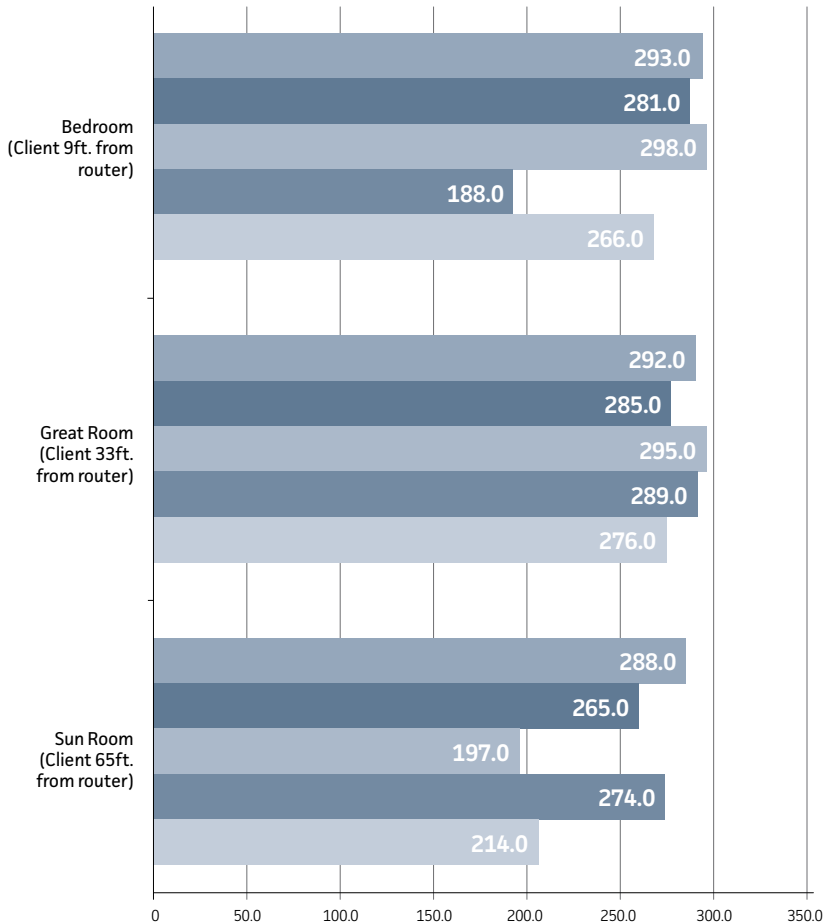
## 5GHz 802.11ac performance

I plugged a D-Link DWA-192 USB Wi-Fi adapter ([go.pcworld.com/dlinkdwa192](http://go.pcworld.com/dlinkdwa192)) into my test client to measure each router's 802.11ac performance. I retired the Asus USB-AC56 adapter I was using previously, because it's limited to two spatial streams where the D-Link supports three. The WRT1900ACS performed very well here, especially at long range. The Google OnHub also performed well; in fact, it was faster than all the other routers when the client was in the same room as the router, nine feet away, and when the client was in my great room, 33 feet from the router with one interior insulated wall in between.

But the new Linksys was the fastest performer by a wide margin at long range, when the client was in my sun room, 65 feet from the router and separated by two insulated interior walls. The OnHub, meanwhile, fell way behind with the client in this location; and the older Linksys was surprisingly slow at close range.

## 5GH 802.11ac Performance, Channel 153

Paired with a 3x3 D-Link DWA-192 Wi-Fi adapter



MEGABITS PER SECOND



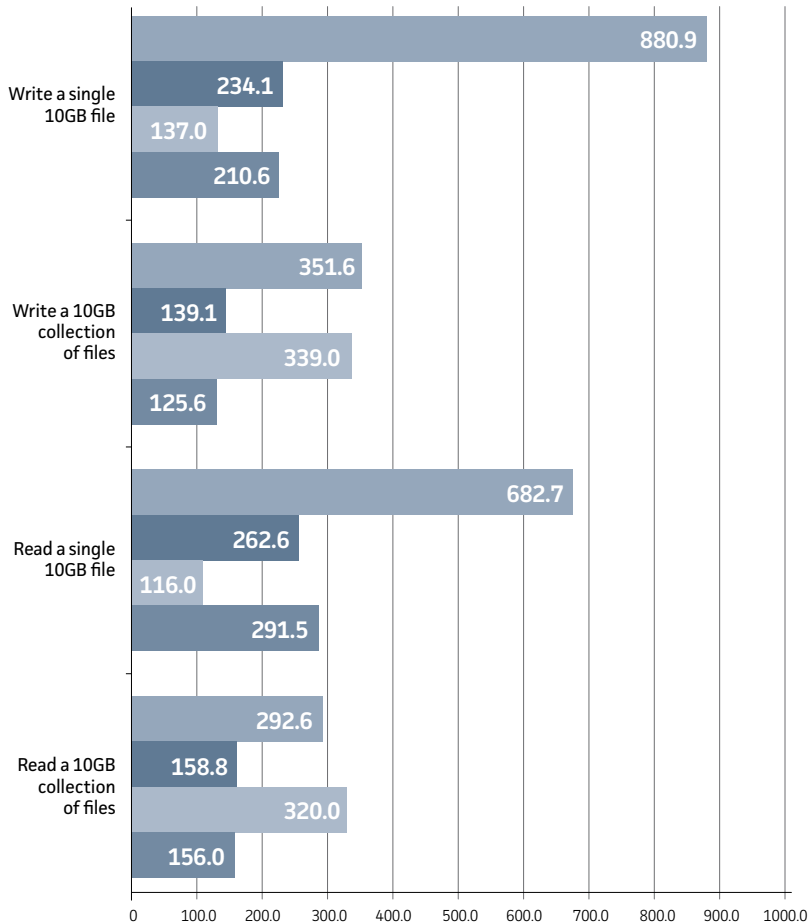
## Network-attached storage performance

If you're looking for network-attached storage, I typically recommend that you buy a dedicated NAS box. The WRT1900ACS has me almost rethinking my position. It is incredibly fast at reading and writing large files (I use a 10GB zip file in my benchmark), and it's very fast when it comes to handling large collections of files, too (I use a 10GB collection of files here). I still think a dedicated NAS box—with a mirrored array for redundancy—is the best approach if you have serious storage needs. But wow, this new Linksys is fast with storage.

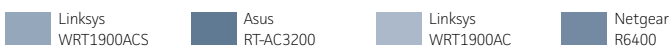
For the record, I use a dedicated SSD in a desktop PC hardwired to the router to transfer files to and from a dedicated USB 3.0 SSD plugged into the router. Most people will connect a mechanical drive to the router and therefore see slower performance, but I wanted to take that bottleneck out of the equation for this benchmark.

## Read/Write NAS Performance

File transfers between a portable USB 3.0 SSD and a SSD in a networked PC



MEGABITS PER SECOND



## Should you buy a WRT1900ACS?

I've been using the WRT1900AC in my smart home ever since that router shipped (it's sitting atop the Linksys SE4008 WRT 8-port switch, which rests in turn on a D-Link DGS-1024D 24-port switch). The router has been supremely reliable, even though my home-run closet tends to get a little warm. Most of my audio and video gear is hardwired to my network, so I don't need the added flexibility that an AC3200 router offers.

I don't have the geek cred—or the patience—to move to open-source firmware, but I will probably move up to the WRT1900ACS in the near future. It's a great router, and Linksys is offering it at the same price as the old one: \$230 (although street prices for the WRT1900AC have since dropped to \$195). 🔌



# M.2 SSD roundup: Tiny drives deliver huge performance

BY JON L. JACOBI

**NO, M.2 (PRONOUNCED** M-dot-two) is not a government spy organization or secret project. It's a small-form-factor (SFF) multi-purpose connector designed to replace the small mSATA and mini-PCIe slots commonly used in laptops. As such, M.2 isn't designed strictly for storage, (it supports USB, SATA, and PCIe), but storage is a large part of what's driving its adoption—even on the desktop.

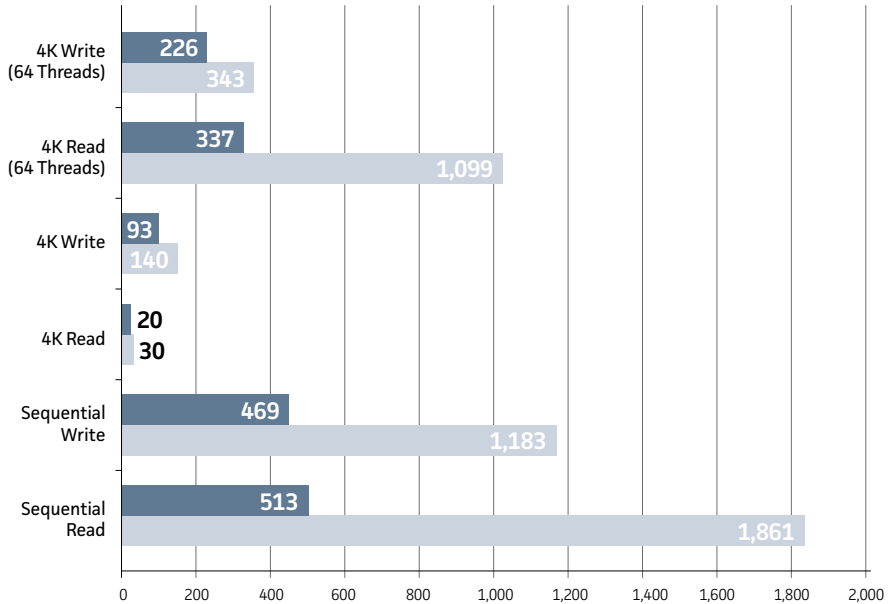
Say what? The thing is, M.2's PCIe connectivity has coincided nicely with the migration of SSD drives to PCIe, to sidestep the 600MBps limitation of the SATA bus. The marriage of PCIe and the SSD has resulted in uber-fast storage for your PC.

When I say uber-fast, I'm talking nearly four times the speed of SATA. Yup: 2GBps. It's hard to describe how smoothly your system runs with



## PCIe versus SATA

### 10GB Test



MBps (LONGER BARS ARE BETTER)

**PCIe SSDs** simply blow their SATA brethren out of the water in terms of sequential throughput, and in the case of NVMe, queued small writes.

Crucial MX200 Samsung SM951 PCIe NVMe

a x4 PCIe M.2 SSD on board. But I'm going to try, and also let you know which of the currently limited, but excellent selection of M.2 SSDs you should buy. Note that there are also SATA M.2 SSDs, but they're subject to the 600MBps limit. Boring, but handy if that's all your laptop supports.

Don't have an M.2 slot on your system? If you're talking about a desktop, you're in luck. Simply add a \$25 PCIe M.2 expansion card, such as the Addonics AD2M2S-PX4 PCIe we used for some of our testing.

## Head to head

We took six M.2 SSD drives for a spin. The state of the art was represented by these drives:

- The \$240, 256GB Samsung SM951 PCIe (AHCI)
- The \$240, 256GB Samsung SM951 PCIe (NVMe)
- The \$499, 480GB Kingston HyperX Predator PCIe (AHCI)

We also ran a last-generation \$200, 256GB Samsung XP941 PCIe (AHCI) through its paces.

Also included are two SATA M.2 drives:

- An older \$300, 320GB Intel 530
- A newer \$99, 256GB Samsung EVO SATA drive

To be perfectly honest, we included SATA drives only to show you the enormous performance gains offered by PCIe. Sneaky, eh?

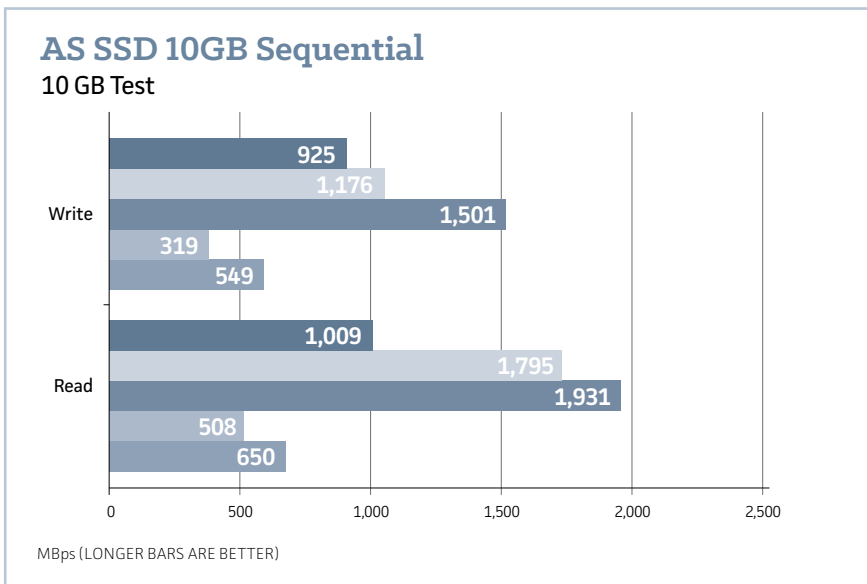
Lastly, there was the aging \$220 Plextor M6e, the first M.2 PCIe (AHCI) drive we ever tested. It's included to show just how far things have come in a little over a year.

You may have noticed the parentheses indicating whether the PCIe drives were AHCI (Advanced Host Controller Interface) or NVMe (Non-Volatile Memory express). AHCI is basically the SATA protocol implemented over PCIe (or any bus really), while NVMe ([go.pcworld.com/nvme](http://go.pcworld.com/nvme)) is a new communications protocol designed from the ground up for non-volatile storage. AHCI over PCIe removes the 600MBps bandwidth limit, but NVMe offers some advantages for multi-threaded operations, as you'll see in the 4K queued test results on page 71.

The only issue with NVMe is that your system must support booting from it. All the motherboards I've seen that offer a PCIe-enabled M.2 slot allow booting from NVMe, but if you're adding M.2 to your desktop via a PCIe expansion card, you may need to go AHCI. Any motherboard of relatively recent vintage should support booting from AHCI.

## Performance

All testing was done on an Asus X99 Deluxe/U3.1 motherboard with 32GB of DDR4 and an Intel Core i7-5820K. We used the motherboard's integrated PCIe-only M.2 slot for the AHCI/NVMe SSDs, while SATA drives were tested using the aforementioned Addonics AD2M2S-PX4 PCIe expansion card. Note that the AD2M2S-PX4 doesn't have a dedicated SATA HBA (host bus adapter). It simply uses SATA cables from the motherboard that plug into the card.



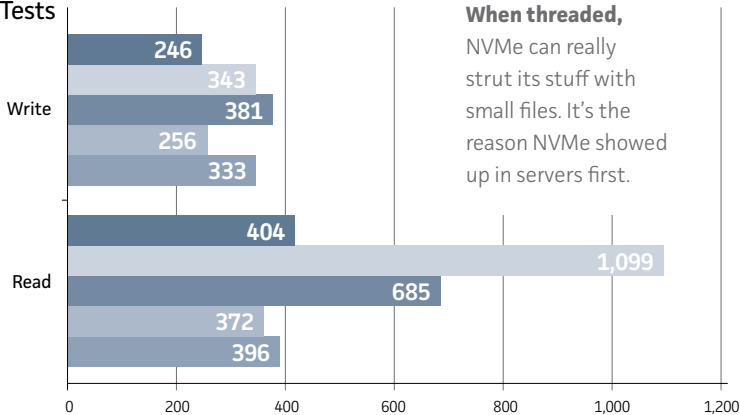
Kingston HyperX Predator PCIe    Samsung SM951 PCIe NVMe    Samsung SM951 PCIe AHCI    Samsung 850 EVO M.2    Plextor M6e AHCI

**PCIe M.2** drives rock when it comes to raw sequential throughput.

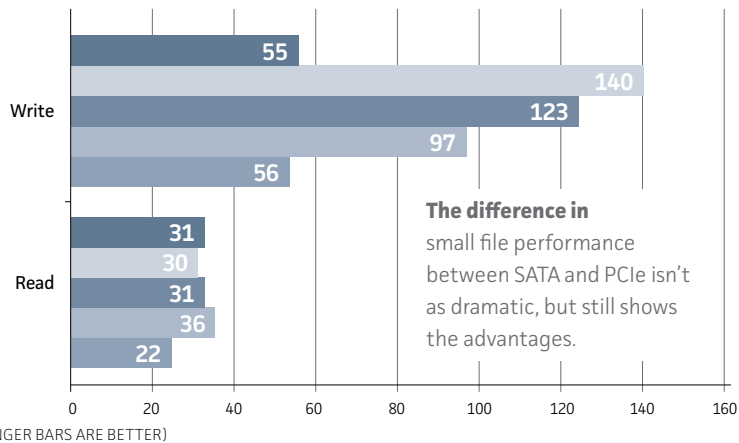
As you can see from the charts, the results were split dramatically by technology. The PCIe drives won by huge margins in flat-out sequential read speed, something you'll notice when you copy large files. NVMe proved faster than AHCI when it's fed small files from multiple queues (the AD SSD 4K/64 threads test). Whether this scenario

## AS SSD 4K, 64 Threads

10 GB Tests



## AS SSD 4K

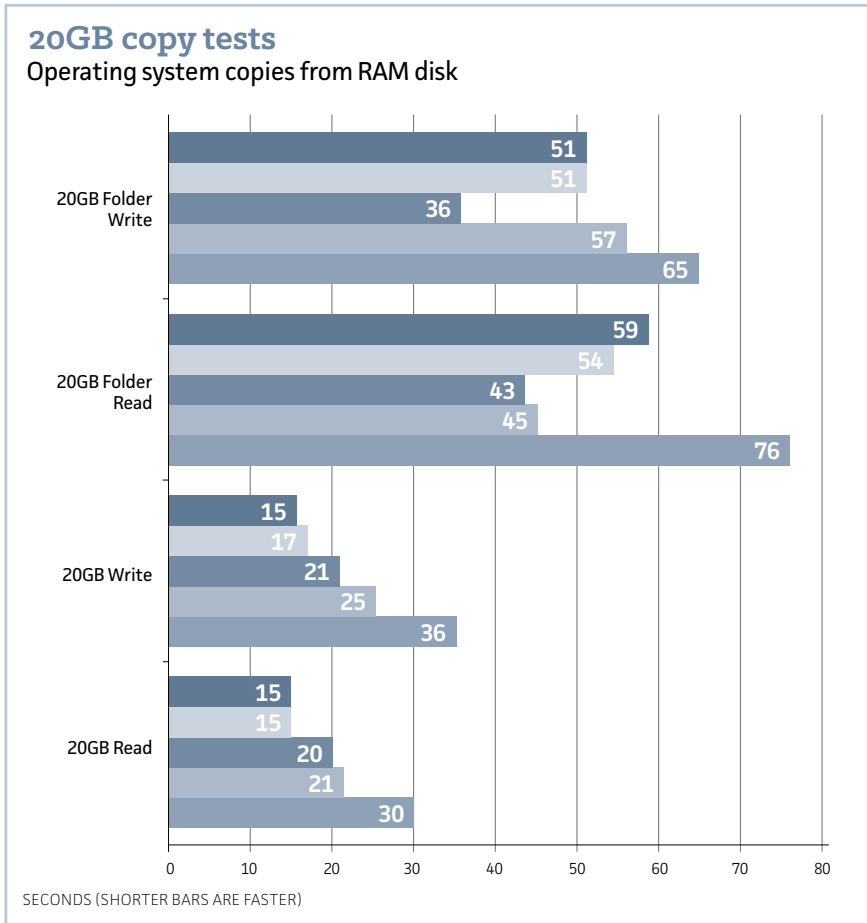


Kingston HyperX Predator PCIe    Samsung SM951 PCIe NVMe    Samsung SM951 PCIe AHCI    Samsung 850 EVO M.2    Plextor M6e AHCI

occurs depends upon your operating system and NVMe driver.

Keep in mind that M.2 PCIe, and PCIe drives in general, are relatively new technologies. The SM951 AHCI, only a single generation removed from the XP941 AHCI, is dramatically faster. Both are x4 PCIe, but the

XP941 is PCIe Gen 2 (500MBps per lane), while the SM951 is PCIe Gen 3 (1GBps) PCIe. But even the x4 PCIe 2.0 provides 2GBps of bandwidth, so that can hardly explain the entire disparity.



**All these drives** are faster than SATA-bound SSDs, writing a single large file, but the Plextor M6e is actually slower than some when it came to writing small files and folders.

Having previously experienced only the Plextor, Kingston, and XP941 AHCI drives, we were surprised and pleased to see that the SM951 AHCI was competitive with its NVMe sibling. Also note that in our real-life 20GB tests, the Kingston proved almost as fast as either Samsung drive.

We've seen well over 2GBps from Intel's 750 series NVMe PCIe card ([go.pcworld.com/nvme750](http://go.pcworld.com/nvme750)) drive, which plugs into an open PCIe slot like a video card (an alternative to M.2 that desktop users should consider), so the SM951 NVMe may not be showing the full potential of NVMe. Intel told us it didn't produce an M.2 version of the 750 because at top speed, the power draw exceeded what's available from M.2 slots. Basically, not all the ducks are in a row yet to fairly evaluate AHCI versus NVMe. It is safe, however, to say that PCIe SSDs obliterate their SATA cousins in terms of raw sequential throughput. They also occupy a slot in your motherboard.

## Here are the details on the drives involved in the testing.

**Intel 530 360 GB ★★☆☆☆ \$300**

This is a decent drive for, say, an older NUC, or small-form-factor PC. But it's still SATA and only a 500MBps/300MBps reader/writer at that. That's certainly enough for the average user, and far faster than a hard drive, but not a product for enthusiasts. The biggest issue is that the 530 series appears still to be priced at about 80 cents per gigabyte—roughly twice what you'll pay for the faster Samsung 850 EVO M.2.





### **Samsung XP941 PCIe AHCI ★★★★★ \$200**

The XP941, with its Gen2 X4 PCIe interface, is a kick in the pants after a SATA SSD, but it pales in comparison to the performance of its newer siblings, the SM951 AHCI and NVMe. Still, if you find it at a bargain price, you won't regret it. At least until Samsung's new SM953 shows up and drives down the price of the SM951.

### **Samsung SM951 AHCI/NVMe ★★★★★ \$240**

If you want the absolute fastest M.2 PCIe drives on the market, these x4 PCIe SSDs are what you're looking for. Lightning on a stick, your system will show a level of responsiveness you probably didn't even realize was possible. The AHCI version is currently faster for large sequential transfers, while the NVMe version is great for server-type, queued loads. This may change as the NVMe implementation matures.



### **Kingston HyperX Predator PCIe ★★★★★ \$764**

The Kingston HyperX Predator PCIe scored lower than the Samsung SM951 in artificial benchmarks, but did exceptionally well in our real-world copy tests. It also ships with an adapter card. Note: You'll see a steep retail price on the Kingston site, but steep discounts just about everywhere else.



### **Samsung 850 EVO M.2 SATA**

This drive is faster than the Intel 530 and a whole lot cheaper, but performance drops with large data transfers. Not catastrophically, as with OCZ's Trion 2.5-inch SATA drive, just down to about the 300MBps level. Still, it's a very good SSD for SATA-only M.2 sockets.



### **Plextor M6e PCIe ★★★★★ \$220**

This AHCI PCIe drive impressed us when it first came out, but a year or two on, it's certainly not worth the premium prices we found online. SSDs in general have dropped significantly in price, and like-priced PCIe drives now out-perform the M6e by a factor of 3. However, if you find it

at a saner price than I did, it provides a nice 100MBps to 200MBps boost over the Samsung 850 EVO and Intel 530.

## **You want one**

I can't emphasize enough how much better your computer will run with a PCIe SSD on board. Grab a small-capacity model, run your operating system off it, and flesh out your storage needs with mid-range SATA SSDs or hard drives. You'll be glad you did.

Currently, the SM951 is top dog, with the Kingston HyperX Predator PCIe delivering just about the same real-world, large-file transfer performance. If you spot a bargain on the XP941, it will deliver a very happy experience as well. If you're looking to leverage an existing SATA-only M.2 slot, then Samsung's 850 EVO is currently your best bet. 🔌





# Quad-channel RAM vs. dual-channel RAM: The shocking truth about their performance

BY GORDON MAH UNG

**ONE OF THE** check-off features of Intel's big Haswell-E CPU is support for quad-channel DDR4 memory, but my testing shows it may not matter much.

Think of memory channels as shotgun barrels. You know from video games that two barrels are better than one. Now think of quad-channel RAM as the four-barrel shotgun of computers: The more memory channels, the more memory bandwidth available to the CPU.

For each channel in a modern PC, you need an individual stick of RAM. This also depends, of course, on the CPU. Consumer chips such as the Core i7-4790K ([go.pcworld.com/corei74790](http://go.pcworld.com/corei74790)) and the new Core i7-6700K ([go.pcworld.com/corei76700](http://go.pcworld.com/corei76700)) support up to two channels, while consumer chips such as the Core i7-5960X can support up to four channels

Normally this doesn't matter. You wouldn't buy an expensive X99 motherboard and pricey Core i7-5960X, then intentionally gimp its quad-channel memory performance by installing only two pieces of RAM instead of four.



**Asrock's X99 MiniITX** board simply does away with two memory channels to save space.

## Meet Asrock's X99E-ITX/ac

The problem? You can't actually fit Intel's Haswell-E chip and the four memory slots it needs into a smaller Mini-ITX motherboard. They just don't physically fit using full-size memory modules. Without access to Intel's Haswell-E CPU, that means miniature PCs are limited to quad-core CPUs at best.

Asrock's crazy solution was simply to leave off two of the slots on its X99E-ITX/ac motherboard. Yes, that cuts your bandwidth in half, but it lets you build such crazy machines as this Falcon Northwest ([go.pcworld.com/falconnw](http://go.pcworld.com/falconnw)) or this exotic CyberPower Trinity Xtreme ([go.pcworld.com/trinityxtreme](http://go.pcworld.com/trinityxtreme)) and run more than four CPU cores. The big question is: How much of a hit do you take?

## How we tested

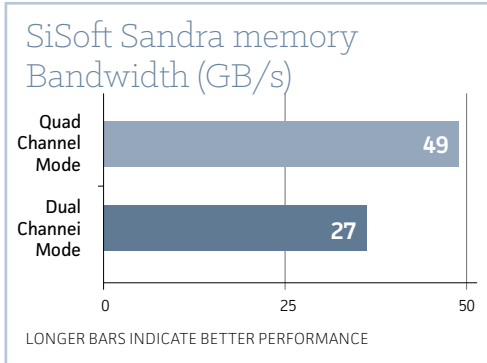
I decided to test just how much real performance you give up by leaving half your system bandwidth behind. As the Asrock X99E-ITX/ac is permanently restricted to dual-channel memory, the only way I could test this was to use a full-size X99 motherboard.

For that I turned to a MicroExpress B20 ([go.pcworld.com/microflex20b](http://go.pcworld.com/microflex20b)) system we reviewed. It has a full-size Asus X99 Pro motherboard and a six-core Core i7-5820K CPU, along with a GeForce GTX 970 card and 16GB of DDR4/2666 RAM in quad-channel mode, using four 4GB modules. I ran several benchmarks with it in quad-channel mode, then swapped out the four sticks of RAM for two sticks of 8GB DDR4/2666 in dual-channel mode.

I could have just pulled two of the systems' original four memory sticks but I decided some would be concerned the 16GB versus 8GB of total RAM would affect the results. It wouldn't, but I'll humor you. So for the record: We're testing 16GB of DDR4/2666 in dual-channel mode versus 16GB of DDR4/2666 in quad-channel mode.



**I simulated**  
dual-channel  
performance  
using this  
MicroExpress  
B20 system  
with its X99  
chipset and  
Core i7-5820K  
chip.



**Sorry, dual-channel RAM:** Quad-channel is way better.

## Sisoft Sandra Memory Bandwidth

My first test was SiSoft Sandra's memory bandwidth test. This jack-of-all trades benchmark suite measures and pokes just about everything in your PC. It's long been a standard to measure

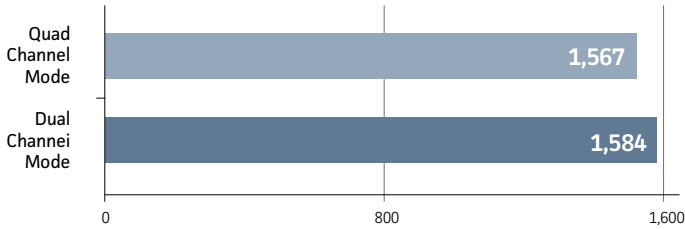
available memory bandwidth in a PC. The results were as expected (and also a good way to double-check that I hadn't put the modules in the wrong slots). Going from dual-channel DDR4/2666 to quad-channel DDR4/2666 nearly doubles the available memory bandwidth. Woohoo! Go home, right?

Nope. This chart is probably the only good news for quad-channel memory, but I'll let you bask in the bandwidth for now. Read on for the real performance impact.

## Encoding performance

Synthetic tests measuring the theoretical performance is one thing, but just where does it show up in real tasks? To find out, the next test I threw at the system was Handbrake. A popular and free video encoder, it's a CPU-heavy test. As video encoding is something that's believed to be bandwidth-sensitive, I thought doubling the memory bandwidth would pay off big-time. Unfortunately, I saw zippo, as you can see on the chart. I was quite surprised, as I've long believed memory bandwidth helps encoding performance. I've actually seen it in the past on older hardware platforms, too, so this was a shocker. I will say: This isn't the last word, as different encoders and different encoding loads could favor the increased bandwidth. But today, I'm pretty disappointed.

## Handbrake Encode 0.9.9 (sec)



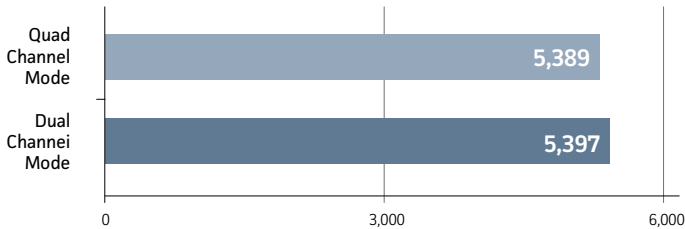
LONGER BARS INDICATE BETTER PERFORMANCE

I saw **virtually** no difference in our encoding test between dual-channel and quad-channel RAM.

## PCMark 8 Creative

My next task was PCMark 8's Creative Conventional test. This synthetic test attempts to simulate a workload of photo editing, video encoding, light gaming, and browsing. I run the conventional portion rather than the GPU portion to keep the workload restricted to the CPU itself. The result was, again, pretty surprising and disappointing.

## PCMark Creative Conventional

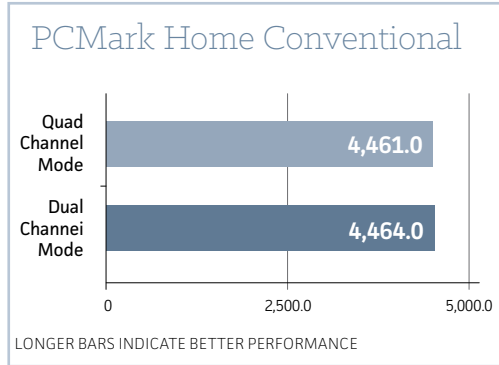


LONGER BARS INDICATE BETTER PERFORMANCE

**PCMark 8's** Creative Conventional test shows minimal impact too.

## PCMark 8 Home

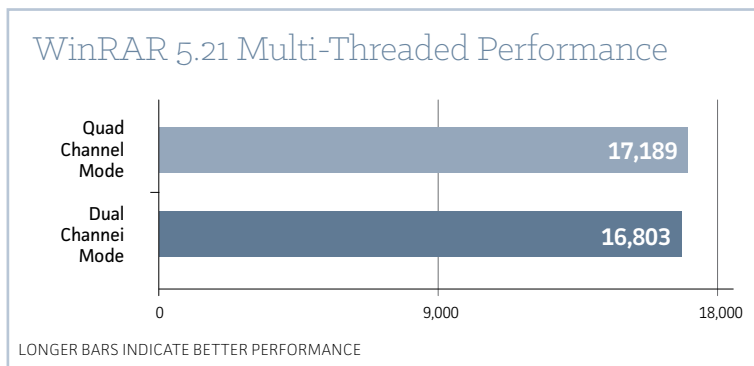
I also ran PCMark 8's Home and Work Conventional tasks to change up the workload. Again, nearly double the system memory bandwidth made no difference. I'm not even going to bother wasting Internet bandwidth with the chart of PCMark 8 Work's result, because it's the same.



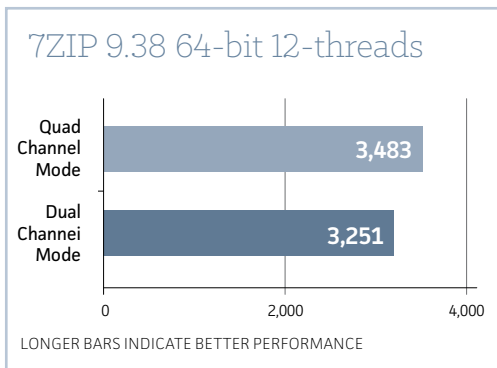
**PCMark 8** Home Conventional test also shows a tie between dual-channel and quad-channel memory.

## WinRAR

Like video encoding, file compression is one of the tasks that typically benefits from boatloads of memory bandwidth. To find out, I reached for WinRAR 5.21 and used its built-in compression benchmark. Finally I saw the increased memory band-width paying off—but not by much.



**Despite file compression** normally benefitting from memory bandwidth, the difference in WinRAR is pretty tiny.



**We do see** an improvement from 7Zip's internal benchmark, but not as much as I'd expected.

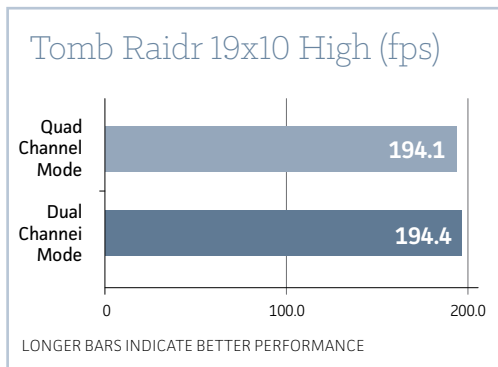
## 7Zip

I also fired up the beta version of 7Zip and ran its internal benchmark. I actually saw a decent boost from 7Zip, but again, I really expected more. I was almost ready to hang it up but decided to run some gaming tests, too, so keep reading.

## Tomb Raider

For the final set of tests, I fired up a few games that aren't on the cutting-edge of graphics. The idea is to use older games that would not be bottlenecked by the GeForce GTX 970 in my testbed. It's a good card and a hell of a deal, but it's no Titan X. To remove any graphics bottleneck, I also ran the games at a fairly low resolution of 1920x1080, and picked lower image quality settings.

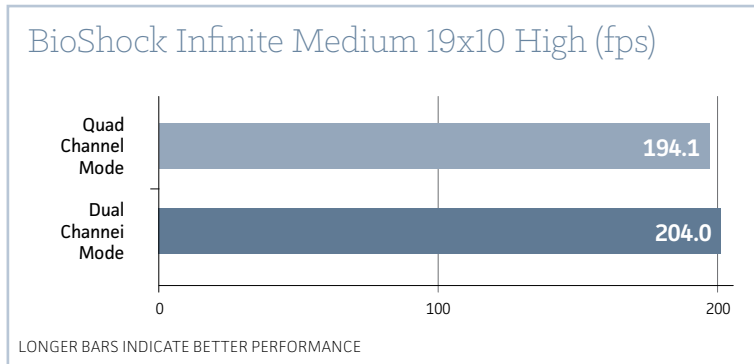
The result? Yup. You guessed it: No diff. Not at ultimate or high. Just squint your eyes and pretend the results are for both.



**Running Tomb Raider** with the system set to either quad-channel seems to make no difference either.

## BioShock Infinite

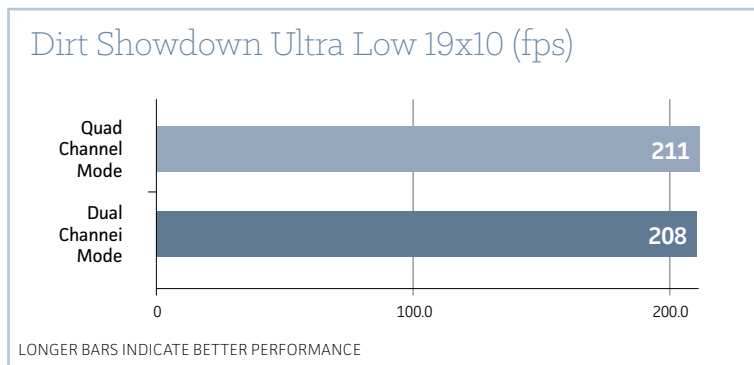
And yes, BioShock Infinite didn't care either, even when pushing 200 fps. Like Tomb Raider, I actually ran the test at high and medium settings but decided not to waste bandwidth since it didn't matter.



**BioShock Infinite** at medium settings also shows very little performance improvement.

## Dirt Showdown

And yes, more of the same in Dirt Showdown. There's no reason to show you the three other settings I ran, because they're all just the same. Read on for my conclusion.



**Dirt Showdown** also shows it's a yawner.



## Conclusion

I've written about Asrock's interesting decision to sacrifice memory bandwidth for core count a few times now. The reaction is usually to recoil from those who just don't want to make that compromise in memory bandwidth. Give up half your memory bandwidth just to make a smaller system with six or eight cores? Never!

I had the same reaction myself originally. After running my tests though, I'm not sure it matters. I'm sure that somewhere out there beneath the pale moonlight, there's a task or benchmark that truly pays the dividends you'd expect by doubling the available system bandwidth, but I'm not seeing it here.

Why? I suspect one reason might be the massive 15MB cache in the 6-core Core i7-5820K processor I used. The quad-core Core i7-4790K has an 8MB cache. That's almost double the cache with only two more cores added to the equation. Could going to an 8-core Core i7-5960X show the weaknesses of cutting system memory bandwidth in half? After my tests, I'm not so sure it will.

I will say, if I built or bought a full-size X99 Haswell-E machine, I'd still want quad-channel memory, because there's just no reason to give it up. But if I had to choose a small box where I got six cores instead of four, and my workloads benefited from the extra CPU cores? I'd have absolutely no problem making that decision to throw memory bandwidth overboard. 🔌

**Sacrificing memory** bandwidth for core count doesn't appear to hurt.



# Who makes the best home-security camera? We test 6 new models to find out

BY MICHAEL ANSALDO



**RENT OR OWN,** we all want to know our homes are secure while we're gone. That used to mean signing on with a professional—and pricey—security service like ADT. But the boom in wireless security cameras is putting home surveillance into our own hands.

These close cousins of webcams require minimal installation and offer flexible setups and a range of security features. Indeed, the offers vary widely by camera, and navigating them all gets more daunting as this category grows ever more crowded. To help you find the best security camera for your needs, we've outlined the key features to consider and tested six of the newest, most high-profile models.

Whether you're looking for an easy way to check on your kids and pets, or a full-service sentinel to monitor for intruders, we'll help find the right product for your needs.

## What to look for when shopping

Most home security cameras perform the same basic functions—they detect an event, record the event, and send you an alert—but they don't all perform them the same way. And some cameras have special features that go beyond those basics. Here are some common features you'll encounter while shopping and why they're important (we've listed them in alphabetical order).

**Alerts:** Home security cameras push notifications to your smartphone when they detect events. Without watching the live feed all day, this is the only way to keep tabs on your home in relative real time. Depending on the camera, it may send text alerts when it detects motion, sound, a face (known or unrecognized), or all three. Some can send alerts to multiple people, usually anyone else in the household using that product's app; others will send emails in addition to text messages as a failsafe in the event you can't access your mobile device.

**Battery backup:** Power outages happen, and clever burglars cut electricity before breaking into your home. When that happens, your camera goes dark and, if there's a crime taking place, you lose all forensic evidence. For this reason, some cameras can also run for



**The Flir FX's** battery backup ensures the camera will continue to operate during a power outage.

a short time on battery power. It's a feature worth looking for.

**Cloud recording:** Many manufacturers offer cloud storage plans with their camera. With one of these, your recorded video is sent to a remote server and stored for a predetermined time— usually anywhere from 24 hours to a week—and then deleted to make space for new videos. Though sometimes free, these cloud plans usually require a monthly subscription, but are worth it both for their convenience and if you want a surveillance record during a vacation or other extended time away from home.

**Facial recognition:** A few newer cameras are experimenting with facial recognition. This feature could more accurately be called “facial identification,” as in practice it's much better at distinguishing a face from, say, a lamp, than it is at actually distinguishing one person's face from another's. If you opt for a camera with this feature, know that it typically learns faces through increasing exposure to them, so be prepared to spend a lot of time in front of the lens.



**The Netatmo Welcome**

supports facial recognition and can alert you when people it doesn't recognize come within its field of view.

**Local storage:** Some cameras include memory-card slots in lieu of, or in addition to, cloud storage, so you can store video right on the device. It's an attractive feature, as it can eliminate the cost of monthly storage fees. The downside (if there isn't a cloud backup) is that if a crook steals your camera, he takes your forensic evidence with it.

**Mobile app:** Most of today's home security cameras are accessed primarily through a smartphone/tablet app. In addition to offering you a reliable way to view the camera's live feed, it should offer plenty of options for customizing the way the camera performs.

The ability to customize notifications, adjust motion and sound-detection sensitivity, and set detection areas are some of the key features to look for. The app should also be intuitive and easy to master.

**Motion detection:** Assuming you're monitoring your home when it's empty, motion detection is one of the most desirable features in a security camera. Built-in sensors pick up movement within the camera's field of view and trigger video recording. Because these sensors are sensitive to any movement—even a shift in lighting or leaves blowing outside a window—it's important the camera system also offer the ability to narrow the range of detection, adjust the sensor's sensitivity, or otherwise customize this feature to cut down on false alerts.

**Night vision:** Most break-ins occur after dark, so this feature is nearly as important as motion detection. Technically, most home security cameras support infrared LED illumination, versus true night vision based on image intensification or thermal vision. Be that as it may, some cameras will switch to night vision automatically in low-



**Any home security camera worth its salt will support motion detection.**

light conditions, while others allow you to customize when and how it should be activated.

**Pan/Tilt/Swivel:** Most security cameras—including all the ones in this guide—can be manually tilted and swiveled to focus on a certain viewing area, but this is a purely set-it-and-forget-it feature. A true pan/tilt camera is equipped with a motor so that you can move its lens—or even follow a moving object if you’re watching a live feed—using its app or browser-based app.

**Resolution:** No amount of security video will help you if it’s blurry, jittery, or otherwise distorted. Look for a camera that offers the highest possible resolution. Most currently offer 720p (often referred to as “high definition” or HD), but some newer cameras are coming out with 1080p (often referred to as “full HD”). Keep in mind that higher-res cameras use more Internet and Wi-Fi bandwidth and battery life. Many cameras also offer a software zoom feature (which is not the same thing as having a physical zoom lens).

**Scheduling:** Scheduling features allows you to tell the camera to turn on and off, detect motion, and/or send alerts at specified times. This is useful when you, say, only want to be notified when your kids get home from school or just want to monitor your home when you’re away. It also reduces the amount of false alerts.

**Security:** There have been plenty of headlines about hackers compromising home cameras, baby monitors, and other Wi-Fi devices to spy on people, so be sure to check what steps each manufacturer has taken to eliminate this problem. Look for a camera that supports up-to-date wireless security protocols, such as WPA2, and make sure it encrypts Internet transmission of your



**The Nest Labs** Nest Cam delivers higher-than-typical 1080p video resolution.

username, your password, and the live feeds. Never install a security camera (or a router or any other device on your home network) without changing its default user ID and password.

**Two-way audio:** While the idea of a security camera implies eyes-on monitoring, the ability to also hear what's going on gives you a more complete picture of what's happening on the home front when you're away. It can also alert you to something occurring out of the camera's field of vision. This feature can also allow you to speak through the camera, a great tool for remotely commanding an unruly pet or startling an intruder in the act, but be aware that you might need to plug in a powered speaker for this feature to work.

**Viewing angle:** The camera's field of view determines how much it can see. As you're probably monitoring a single room, you want a wide viewing angle. Most current cameras fall in the 130-degree range. These wide angles can sometimes cause image distortion at the edges in the form of a fish-eye effect, particularly when used in smaller rooms, but it's not like you're going to use a security camera to capture snapshots for your photo album.

**Web client:** Many cameras can be accessed through a web portal as well. This is useful for times when you don't have access to your mobile device or a wireless connection. The web app should closely mirror its mobile counterpart, so you don't need to learn a whole new set of controls.

**Wireless range:** One of the benefits wireless cameras offer is the ability to move them around your home. Ideally, your home



**Logitech's Circle**  
home-security camera features two-way audio.

security camera should be able to maintain a Wi-Fi connection no matter how far you move it from your router, even in a large home. Some cameras come with an Ethernet port as well, so you have the option of hardwiring it to your local network. A camera that supports Power-over-Ethernet (PoE) eliminates the need for an AC adapter and relies on just one cable (but your router or switch will also need to support PoE. Another alternative would be to use a PoE injector.) 🔌



# Arcsoft Simplicam: Sophisticated security done simply

BY MICHAEL ANSALDO



**ARCISOFT IS KNOWN** for its behind-the-scenes technology that usually ends up on your camera or smartphone; but with the Simplicam (\$150; [simplicam.com](http://simplicam.com)), the company has stepped into the spotlight. And this unassuming little home surveillance camera is worth your attention.

Powered by Closeli cloud services, the Simplicam offers high performance with extensive customizability and a new facial-recognition feature that makes an easy entrée into the world of DIY home security.

### **What you get**

The Simplicam cuts a fine figure with its gloss-black face and aluminum frame. The camera itself pivots up and down and swivels 360-degrees on its ring-shaped stand, providing a multitude of viewing angles. It also comes with a plastic wall mount and a 10-foot long power cable. It's missing one major feature, though: It doesn't have a back-up battery.

The Simplicam streams 720p live video and has a 107-degree field of view, which is smaller than what's offered by many other cameras in

this price range. At night, it uses a ring of infrared LEDs around the lens to light up dark rooms. It also features two-way audio. The camera can be operated from a web app or the Closeli app for iOS or Android.

The Simplicam offers both motion and sound detection and allows you to calibrate the sensitivity for each so that you're not inundated with alerts every time your dog wags his tail in proximity of the camera.

The camera's differentiator, however, is facial recognition, which should reduce false alerts by helping the camera distinguish between motion made by a human versus a pet or a car passing in front of a window.

Currently in beta, this feature allows you to enter up to 10 people in the app's face-recognition manager. You can then configure privacy settings for each person, such as telling the Simplicam to stop recording or to send you an alert when that person is recognized. The app also provides ways to improve the camera's recognition of each individual as it acquires more video footage of them.

But facial recognition is available only with one of three Closeli



#### Detection Zone: The

Simplicam app lets you adjust sound and motion sensitivity and set motion detection zones.

## Roundup: Security Cameras

recording plans, which you'll also need for saving video as the SimpliCam has no onboard storage. For \$5 per month or \$50 per year, you can view the last day's recordings and save up to one hour of clips. You can review the past 11 days of recordings and save up to three hours of clips for \$14 per month or \$140 per year. And \$23 per month or \$230 per year gets you 21 days of recordings and up to 5 hours of clips.

### Setup and usage

To set up the SimpliCam, you can either plug it into your computer and run an installer or connect it wirelessly using the smartphone app. I used my iPhone, which required that I log in to the app, add the camera, and enter my Wi-Fi info. The app generated a QR code, which I held in front of the camera until it beeped twice to let me know it had scanned it. Within minutes, the camera was connected to my network, and I was getting a live feed on my phone.

The SimpliCam's video quality was clear, if not exceptionally sharp, and I could easily make out details in both normal and night vision. There was negligible image bending at the edges of the frame, and no distortion even when using the 4x digital zoom to focus on areas of interest.

The Closeli app is one of the SimpliCam's strengths. Your live feed, or feeds if you have multiple cameras set up, appear on the home screen. Tap on the one you want to view, and it opens a feed window with controls to turn off the camera's speaker and microphone, access the facial-recognition manager, and take screen captures of the live feed. The last is particularly handy as you can quickly save visual "evidence" to your phone's

### Arcsoft SimpliCam

#### AT A GLANCE

Its facial recognition needs seasoning, but the SimpliCam's customizable detection features and low cloud-storage fees make it one of the strongest home security cameras available.

#### PROS

- Excellent app
- Extensive customization options
- Low starting subscription fee

#### CONS

- Unreliable facial detection
- No battery backup
- Video is stored in the cloud only

\$150

★★★★★

camera roll.

Beneath this is a scrolling timeline that marks events with color-coded bars: yellow for face detection, orange for movement, gray for no events. Tapping a bar takes you to the video record of that event. My man-fingers, however, found it tough to be precise with these thread-thin bars, so I usually opted to press the event icon at the bottom of the screen, which opens a page of all your event clips. You can filter these by motion, sound, or face detection. You can also download or manually delete cloud-stored videos from either the timeline or the events page.



Video playback of these clips is instantaneous and butter-smooth. The audio, while tinny, is clear—in one clip, I could even make out dialog on a downstairs TV recorded while the camera was in an upstairs bedroom.

One of the pitfalls of any Wi-Fi security camera is its tendency to inundate you with alerts any time it detects errant movement. The SimpliCam has a couple of features that help keep it from crying wolf. The first is its notification flexibility. Rather than getting an alert anytime it detects anything—which is the default—the SimpliCam can be configured through the app to send you alert summaries every 10, 30, or 60 minutes. Alternatively, you can schedule alerts to be sent to you at set times.

The second is its ability to calibrate the camera's sound and motion sensitivity and set detection areas. The first two are accomplished by adjusting sliding scales that range from "Bam" to "Whisper," and from "Crash" to "Tiptoe" respectively. The last allows you to designate motion detection areas by tapping squares on a grid overlaid on the

**The SimpliCam**  
pivots and swivels on its ring-mount to provide a multitude of viewing angles.

## Roundup: **Security Cameras**

video. This feature, in particular helped me stanch the fire hose of alerts I was receiving every time my cat wandered into frame of the camera.

As for the SimpliCam's marquee feature, it was fairly successful in detecting faces, but less so in recognizing them. After I added mine to the face recognition manager—which entailed it taking a series of front and profile pictures of me—it usually, but not always, alerted me when I passed in front of the lens. Unfortunately, I had it set to not notify me in those instances. To be fair, the SimpliCam website warns that it can take several weeks to really learn your visage, a luxury it didn't have during my testing.

### **Bottom line**

Aside from the hiccups with its facial recognition—which will likely get smoothed out soon (SimpliCam is soliciting customer feedback to improve it)—the SimpliCam worked as-advertised in my hands-on testing, no small thing in the often-buggy world of security cameras. Its performance, extensive customization options, and cloud-storage subscription fees that start below the usual \$10 per month are plenty to recommend it. 🔒



## Flir FX: This security camera needs work to compete in a crowded category

BY MICHAEL ANSALDO

**FLIR IS BEST** known for building thermal cameras that help users detect household problems such as pest infestations and leaky pipes. Flir FX ([flir.com/flirfx](http://flir.com/flirfx)) is the company's first home security camera, and, at \$200, it's priced to compete with the Nest Cam—successor to the popular Dropcam Pro—and other DIY models such as the SimpliCam, Netatmo Welcome, and Logi Circle.

But the Flir FX has ambitions beyond home security. If you're willing to spend more money on the appropriate accessories, the modular camera can also be retrofitted as an outdoor surveillance camera, a GoPro-like action camera, or a dashboard cam. We only tested it in its indoor surveillance capacity, and it impressed with its array of features. But it has some hurdles to overcome before it's ready to contend in an already crowded DIY security category.

## Roundup: Security Cameras

### What you get

The utilitarian Flir FX comes on a detachable stand, and its power cable can be connected to this base or directly to the camera. Two internal batteries—one in the camera and one in the stand—combine for up to four hours of juice, allowing you to untether it for more mobility or to capture security footage in the event of a power interruption.

As is becoming more common in this increasingly competitive category, the Flir FX can record video in 1080p resolution—though it streams in 720p—and it offers a generous 160-degree viewing angle.



**You can also** order the Flir FX in an out-door configuration for \$250 (a \$50 premium over the standard indoor model).

It's equipped with an integrated mic and speaker for two-way audio, and it has infrared "night vision" up to about 30 feet for operation in low-light indoor conditions.

The Flir FX can detect sound, not just motion, and you can set it up so that either event type will trigger a video recording. To reduce false alerts, the Flir FX app employs Flir's SmartZone technology, which lets you designate

monitoring areas on a grid that overlays the video. Movement in one of these zones will trigger a recording and push an alert to your mobile device; any motion outside the specified area will be ignored.

The system's other compelling feature is RapidRecaps, which can condense hours of footage into an activity highlight reel. Rather than a time-lapse digest that presents a linear chronology of events, RapidRecaps compiles all motion activities within a time frame you specify and compiles them into a single video. The result is you view all those individual events at once, with timestamps on each moving

object to tell you when it occurred.

All recorded footage can be saved locally to an SD card or stored in the cloud via one of Flir's subscription offers—and you must have a subscription plan to create RapidRecaps. The Flir FX includes complimentary access to Free Cloud Basic, which gives you 48 hours of video storage and three RapidRecaps per month. FLIR Cloud Plus and FLIR Cloud Premium extend storage to seven days and 30 days for \$10 per month and \$20 per month respectively. Both of these plans come with unlimited RapidRecaps.

If you want to use Flir FX to capture your extreme sports adventures—terrestrial or underwater—be prepared to shell out an additional \$70 for Flir's sport camera case ([go.pcworld.com/flircase](http://go.pcworld.com/flircase)). To use it as an in-car camera, you'll need the \$40 dashboard mount ([go.pcworld.com/flirdashmount](http://go.pcworld.com/flirdashmount)). The outdoor model, meanwhile, costs \$250.

## Setup and usage

Setting up the Flir FX hardly went smoothly in my tests. The first camera Flir provided for me wouldn't power on, and, after the company determined it may have shipped me a pre-production unit, it sent me another. This one powered on initially, but I couldn't complete the setup process, which involves scanning a QR code on the bottom of the camera and connecting it to your Wi-Fi network. Despite about a half-dozen attempts following the in-app prompts, I couldn't get the app to recognize the camera. Shortly after, that camera also stopped powering on and I was never able to revive it despite troubleshooting help from a representative in Flir's engineering group.



**Flir's RapidRecap** feature can show you the events it recorded over a period of time, with timestamp overlays on each event.



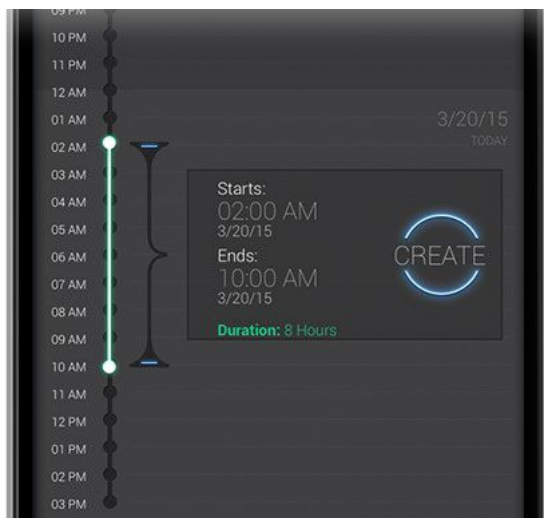
## Roundup: Security Cameras

Third time's the charm, though, and after Flir sent me yet another unit, I got the camera up and running. Even when the setup went as designed, it wasn't as plug-and-play as other security cameras I've tested. The camera must first charge for about 20 minutes, and the connection process requires that you switch back and forth between the Flir FX app and your device's Wi-Fi settings. Altogether, it was about a half hour between unboxing the camera and getting it online.

When you're within 500 feet of your router, the Flir FX gives you direct Wi-Fi access to your live feed and videos on an SD card. Beyond that range, the connection switches over to Flir's cloud servers. In practice, the transition is seamless. I noticed no difference in connection quality; whether I was home or out and about, the feed was smooth and the audio was clear.

Positioned atop the entertainment center in my living room, the 160-degree lens gave me a view of most of my townhome's entire downstairs with no image bending. Streaming video was periodically pixelated and choppy, usually when something or someone was moving quickly through the frame, but the recording of that event would be sharp and smooth. Night vision made the image grainier, though, with less tonal gradations, which made it tough to see details in the environment.

The Flir FX is accessed and controlled through its accompanying mobile app (Flir says a web portal is in the works). A thumbnail image of the room being monitored appears on the home screen. Tapping the More menu (three dots in a vertical line) on a bar above



**Using a** scrolling timeline, you can select hours of footage to be compiled in RapidRecap video digest.

this image opens a drop-down menu with options to create RapidRecaps, view recordings, and turn notifications on and off.

The app is fairly intuitive. Tapping the thumbnail image takes you to the camera's live feed. Two buttons appear beneath the feed window: Actions and Recording. Pressing the first opens a radial menu with options to (again) create RapidRecaps, use the mic, take a snapshot of the feed and save or share it, and access settings such as night vision and sound and motion sensitivity.

As you'd expect, the Recording button opens its own radial menu from which you can stop and start recording and activate/deactivate sound- and motion-triggered recording.

False alarms are inevitable with any security camera, but I was successful in reducing the Flir's by calibrating the camera's motion sensitivity. You adjust this using a slide control that ranges from low to high. I found the sweet spot to be right in the middle. I cut down alerts even further by creating a SmartZone that limited the motion-detection area to the front door. With the camera trained on that space, I was only getting an alert once every hour or two with my family in the house, and that was only when they walked in front of the door on the way to the stairs.

Sound sensitivity proved tougher to master. Even with it turned all



**Attempting to** configure the camera's onboard mic too often returned this error message.

## Roundup: Security Cameras

the way down, I was getting “audio event” alerts every few minutes, even with just the pets in the house. I finally turned off sound-triggered recording to save storage space.

At one point, I decided to create a RapidRecap of some of the overnight footage I recorded. This entails swiping along a scrolling timeline to set the start and end times for the hours you want to capture. Creating the recap isn’t quick; I selected a span of five hours and the recap took a full five minutes to produce.

### Flir FX

#### AT A GLANCE

The Flir FX has an impressive array of features, but this home security camera has some hurdles to overcome before it’s ready to contend in a crowded DIY security category.

#### PROS

- 160-degree viewing angle
- Crystal-clear video
- Local and cloud storage options

#### CONS

- RapidRecaps are hard to follow
- Buggy two-way audio
- Takes nearly 30 minutes to set up

\$200



As far as I could see, there was no progress monitor other than a percentage above the RapidRecap icon, which is visible only when the actions menu is open. I did, however, get an alert when the recap was ready.

The resulting videos—plural, because RapidRecap breaks the activity up into smaller videos to keep the scene from becoming too busy—combined several events triggered by the family cat’s nocturnal wanderings into a collage of ghostly images of him stalking and leaping over himself. It was an eerie effect heightened by the night vision and floating timestamps. Though it made for curious viewing, the superimposing of asynchronous images over each other made it tough to follow the chronology of the footage. While it may be OK for a log of the day’s events, it’s probably not something you want to contend with if you’re


trying to provide forensic evidence of a crime to the police.

I never did get the mic to work, though. Each time I used it, not only did no sound come from the camera, but the app—including the live feed—froze. Sometimes I'd get an error message, and other times the feed would refresh and the app would start working again.

## Bottom line

If you're considering purchasing your first DIY security camera, the Flir FX has a lot to like. Its 160-degree viewing angle, double battery, and combination of local and cloud storage outdoes that of many of its competitors. Its app is well designed and extremely easy to use, and it offers the flexibility to configure sound and motion detection so that it's accurate without being intrusive.

But while it's a good idea, the daily video recap is implemented better in the Logi Circle's Day Brief feature than it is here. The mic issue and the hardware problems I experienced with the first two units I was provided also raise some concerns.

If you're willing to weather a new product's growing pains, you'll likely love what the Flir FX has to offer. If not, you're better off exploring the many other cameras on the market until Flir gets some of these issues ironed out. 

## Roundup: **Security Cameras**

### Logitech Circle: This camera puts more emphasis on 'home' than 'security'

BY MICHAEL ANSALDO

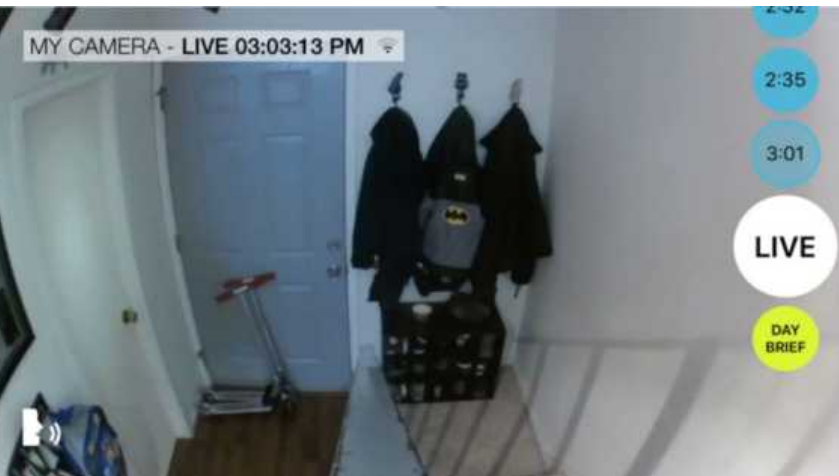


**LOGITECH IS NO** stranger to the swelling home-security market, having marketed the WiLife and then the Alert series of cameras (both of which have since been discontinued). The company is now taking another stab at the market with the \$200 Circlem ([logitech.com/circle](https://logitech.com/circle)). But while this camera is priced to sell alongside other home-monitoring cameras, its lightweight security features make it more suited for capturing precious moments than bad guys.

### **What you get**

Given Logitech's years of experience making webcams, it's not surprising the Circle doesn't stray far from that design style. The pod-like camera is about the size of a tennis ball and sits on a charging dock and ring-shaped magnetic mount. As this last piece can also be screwed into a wall, the Circle can be placed on virtually any horizontal, vertical, or other-angled surface. Aside from the activity light—which shines white when the camera is watching—there are no buttons or other adornments on the camera.

The ball portion of the camera can swivel 360 degrees without losing contact with its charging base, as well as pivot up and down. It's recommended that it remain plugged into a power outlet, but it does have an onboard battery Logitech claims is good for about three hours (12 hours in low-power mode), so surveillance will be uninterrupted in the event of a short power outage or an intruder cutting your home's electricity.



**The Circle's magnetic** mount lets you place it virtually anywhere, even on a metal staircase railing. A scrolling activity log tracks motion events.

As the Circle's 135-degree lens monitors the environment, the camera streams live video to your smartphone in 720p HD resolution with 8x digital zoom capability. In low-light, the camera can switch to infrared night vision with a range of up to 15 feet. A two-way audio system lets you remotely communicate with pets, children, or anyone else in your home.

When the Circle detects motion, it starts recording and pushes a notification to your phone. You then have 24 hours to review the motion event and have the option to save the event locally to your phone for later viewing. Lest you think you're going to get an alert every time your kitchen curtains flutter or there's a change in daylight, the Circle features a technology called Scene Intuition which extracts

## Roundup: Security Cameras

objects, people, and faces, from the monitored environment while filtering out unwanted motion triggers, such as moving leaves.

Another feature called Day Briefs eases the headache of slogging through hours of surveillance footage. Using Scene Intuition, the Circle rounds up the day's most "interesting and important" events and generates a 30-second timelapsed highlight video so you can easily digest all the day's action.

Recorded video is encrypted and stored free in the cloud for 24 hours, after which it's deleted to make room for the next day's footage. Each account has its own private cloud on the Circle Cloud Service and is protected by an account password. According to Logitech, longer-term storage options under a premium (i.e., extra cost) offering are in the works.

### Setup and usage

The Circle immediately differentiated itself with its easy setup. The camera came charged, so I just set it on top of our entertainment center and downloaded the app, which is the sole interface for the camera—there is no web portal. Within seconds of launching the app and logging in to my home network I had a 135-degree wide-angle view of my living room.



**The Circle's industrial** design doesn't stray far from Logitech's webcams.

The app's main screen shows your live feed in landscape mode only, with a scrolling activity log of time-stamped events down the right side. To view a specific recording, you just press the time stamp. Tap the Day Brief icon to get a CliffsNotes version of the day's recordings. These daily roundups are actually the Circle's best feature; one I'd love to see more security cameras adopt.

Swiping left on the feed screen opens

an overlay with the camera's control panel. From here you can turn the camera on and off, put it in low-power mode, activate night vision, and perform a few other basic functions.

One afternoon, I decided to use the camera to check on my dog while I was away. I corral him in the foyer when I know I'll be gone for just a short time, but there's no convenient surface there to place the camera, so I unplugged it and mounted it on the metal staircase banister. That gave me the perfect vantage point for monitoring him,

and the two-way audio gave me the opportunity to listen in and give him voice commands when he got into mischief. I also found, however, that the Circle's battery lasted only about half of the promised three hours.

Live video was clear in all my tests, with accurate colors in both day and night mode; but there was significant image bending at the top and sides of the frame. Predictably, using the pinch-and-zoom feature rendered the image fuzzy, making it hard to distinguish smaller details.

Because the Circle offers Scene Intuition in lieu of the manual motion-detection settings offered by most other cameras in its price range, you're at the mercy of Logitech's algorithms when it comes to determining what's an "interesting" event. It became apparent that the Circle's definition is "anything that moves

## Logitech Circle

### AT A GLANCE:

Logitech has a long history in the home-security-camera market, but this product has more in common with a webcam than its competition.

### PROS:

- Day Briefs provide a digest of recordings
- Setup is a snap
- App is dead simple to use

### CONS:

- Relies on algorithms to determine what and when to record
- Lacks customization options
- Short-lived backup battery

\$200





## Roundup: Security Cameras

in front of the camera.” After receiving generic notifications stating “Activity detected on My Camera,” I’d frequently find recordings triggered by a rotating fan or my dog’s wagging tail.

To be honest, the Circle is distinguished more by what it doesn’t offer than what it does. There are no scheduling capabilities, and you can’t program it to record specific movements, patterns, or times of day. There’s no web app, nor are there options for managing notifications.

Logitech tries to qualify this by calling it a “home connection camera,” but the reality is that at \$200 it’s competing with the likes of the Nest Cam, the Flir FX, and other full-featured security cameras. By that measure, it falls well short.

Each account has its own private cloud on the Circle Cloud Service and is protected by an account password.

### Bottom line

The Circle offers decent video quality, flexible mounting options, and a simple app if you’re willing to pay a premium for a nanny/puppy cam. But the lack of customization options hamstringing it as a security camera. A Logitech representative assured me the company plans to incorporate features such as scheduling as the product evolves, and that it’s currently working on a web app. With the addition of these kinds of advanced features, I could see the Circle developing into a contender. Until then, there are plenty of better options on the market. 🔌



## MyFox Security Camera: This stylish camera is slim on customization options

BY MICHAEL ANSALDO

**THE MYFOX HOME-SECURITY** camera can operate on its own or as part of the MyFox Home Security System ([getmyfox.com](http://getmyfox.com)), a product that initially impressed ([go.pcworld.com/foximpress](http://go.pcworld.com/foximpress)) but ultimately disappointed us ([go.pcworld.com/foxdisappoints](http://go.pcworld.com/foxdisappoints)) due to the system's limitations. The company's camera is burdened by some of the same concerns, and it feels a few iterations away from holding its own with similarly priced security cameras.

### What you get

The MyFox camera sits inside a cylinder about the diameter of a drink coaster, which rests on edge atop a plastic base. While you can change the vertical angle slightly by rotating the camera up and down on this base, there's no side-to-side swivel—you must reposition the entire unit to change its horizontal viewing angle.

The camera comes with a long power cord that gives plenty of

## Roundup: Security Cameras

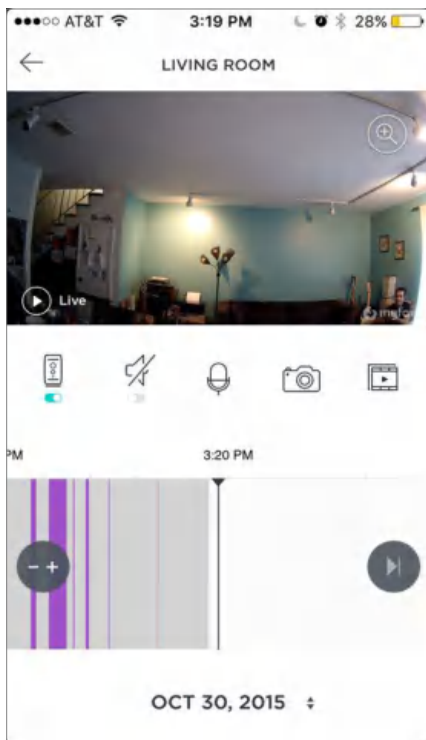
leeway for positioning it away from power outlets. It also has an internal battery that will keep the camera rolling for an hour if there's a power outage. MyFox sends an alert to your phone when the power goes out, and again when it's restored. If it loses its connection to the Internet, the camera will record footage to its internal memory. If you pay for continuous recording service, it will transfer the video to MyFox's servers when the connection is re-established.

The MyFox features streams in 720p with a 130-degree wide-angle lens and night vision up to 5 yards. It also boasts a two-way intercom that's activated from the MyFox app.

The MyFox camera's most compelling feature is a motorized shutter that's controlled from the MyFox app and covers the lens whenever the camera is turned off. It's a feature that's surprisingly

assuring given the privacy vulnerabilities that have been discovered in many webcams and other home-monitoring devices.

While the camera provides a live feed out of the box, you need a subscription to one of MyFox's cloud-recording services to store video in the cloud. For \$5 per month you get one day of video history; \$10 per month gets you an entire week of storage. MyFox is



**The purple** bars in this scrolling time line in the MyFox indicate security events in MyFox's live feed.

currently offering a free two-week trial with the second option.

Given the French manufacturer's experience in home security, you get the expected level of care with your data. Video transmission between the camera and the cloud uses a 2048-bit SSL encryption key, and video streams are encrypted with 2048-bit Transport Security Layer (TLS). The same encryption level is used when connecting your smartphone to the MyFox cloud. All videos are stored with AES-256 encryption.

## Setup and usage

Setting up the MyFox is fairly simple: once you downloaded the app, it walks you through the process for creating an account, entering your Wi-Fi information and adding the camera to your

network. The whole thing took about three to four minutes.

The MyFox's 720p video is pretty standard in this price range, and it's crisp and clear with moderate fish-eyeing in smaller rooms. It remained that way when switched to night mode, and there was minimal distortion when using the 4x "magic zoom" on the image in either mode.

In addition to the power and Internet outage alerts, the MyFox sends you a notification if the camera detects motion. Unlike with some other cameras, the MyFox doesn't offer a way to adjust the sensitivity of the motion detection, so I was getting alerts every few



**The MyFox**  
Security  
Camera's  
privacy shutter  
is an effective  
feature for  
thwarting  
snoops.

## Roundup: Security Cameras

minutes because one of my cats moved in proximity of the camera. It was annoying enough that I eventually turned the motion detection off.

I tested the mic while I was in the house and the audio was plenty loud but buzzy, with no improvement even when I held the phone

farther away from my mouth. The sound from the live feed was actually much clearer, and I could easily make out conversations the camera picked up when I was in another room.

You access your live feed by selecting your camera from the MyFox app's home screen. The feed screen looks much like the one for SimpliCam's app—the feed appears at the top. Beneath that, you'll find controls for the privacy shutter, microphone, and speaker, and a button to take screenshots of your video feed that are saved to your phone's camera roll. Under these is a scrolling timeline where security events are recorded as purple bars; you just scroll the timeline back to one of them to view that event's video footage.

Despite this labyrinthine menu, the app doesn't offer much in the way of camera customization options. Every function—motion detection, night vision, HD video—comes with basically two options: on or off. Several comparably

### MyFox Security Camera

#### AT A GLANCE

The camera is solid but it's handcuffed by a lack of customization controls and a confusing app that limits it as a home-security solution.

#### PROS

- Privacy shutter can cover lens when you're at home
- Backup battery
- Local and cloud storage options

#### CONS

- Confusing app
- Limited customization options
- No way to manage notifications

\$199



priced cameras allow you to set motion detection areas or to change the intervals at which you receive alerts to reduce false alarms and nagging notifications. None of those were available with this camera.

I asked a MyFox representative about this and was told that scheduling options and the ability to manage notifications are currently available only to customers who use the camera as part of its full MyFox security system. The spokesperson said the company is working on making notification management available to customers who purchase the camera on its own.

Finding your way to the settings on the MyFox camera does involve something of a challenge. One would logically assume they'd be under the menu header Settings, but this contains just one control: a button to deactivate the automatic opening and closing of the shutter. To find the rest, you must tap the menu button and follow the path System > *Camera Name*. It's hardly intuitive, and I found the app felt unfinished.

## Bottom Line

The MyFox security camera is a solid piece of hardware. But the app, with its lack of customization controls and muddled menu layout, really limit it as a home-security solution. The camera's privacy shutter is its strongest feature by far. Knowing someone can't remotely hack their way into my living room when I'm home because the lens is covered helped me feel more at ease. If only the camera made me feel that secure when I was away from home. 🔌

## Roundup: **Security Cameras**



### Nest Cam: This Dropcam Pro successor delivers top-shelf security

**BY MICHAEL ANSALDO**

**NEST LAUNCHED ITS** first security camera, the Nest Cam ([nest.com/camera](https://nest.com/camera)), earlier this year. Essentially a sleeker version of the Dropcam Pro—which the Alphabet-owned company acquired when it bought Dropcam last year—the Nest Cam also brings a few improvements, including sharper video, enhanced night vision, and better sound and motion detection for the same \$200 price.

#### **What you get**

The most immediately noticeable difference from the Dropcam Pro is

that the Nest Cam looks and feels like a more quality product. A new swivel joint gives you a lot more flexibility for choosing viewing angles, and its magnetic base similarly provides many more mounting options. It also comes with a wall mount and screws for more secure and permanent placement. As an extra security measure, there are no buttons on the camera itself; all functions are controlled from the Nest app.

While the Nest Cam provides the same a 130-degree wide-angle view as the Dropcam, it streams in 1080p—a bump from Dropcam’s 720p—at 30 frames per second. Eight infrared LEDs ringed around its lens deliver enhanced night vision, and an integrated mic and speaker enable two-way communication.

Once it’s set up, the Nest Cam scans the environment to get a baseline of the room when it’s still. Once you enable motion alerts, the camera’s built-in sensors trigger the camera to record video of the scene and push notifications to your mobile device if it picks up a door opening, a body passing in front of the camera, or other movement. If you enable audio alerts as well, the Nest Cam will respond similarly when it detects sounds above the ambient noise level of the room.

One crucial difference between the Nest Cam and some other cameras we reviewed is that it must be plugged into an outlet at all times—the Nest Cam does not have battery backup. That’s significant, because if the electricity goes out or an enterprising burglar cuts the power to your home, the camera stops working.

You get free access to live video out of the box, but you’ll need to

**With 1080p video** streams, the Nest Cam delivers higher resolution than many of its competitors.





## Roundup: Security Cameras

pony up for a Nest Aware with Video History subscription to take advantage of all the Nest Cam has to offer. You can sign up for either a 10- or 30-day cloud-stored Video History plan (10-day, \$10 per month or \$100 a year; 30-day, \$30 per month or \$300 per year), which will let you review past recordings for the selected term.

Either subscription will also let you create and share video clips, condense a day of video into a 30-second time lapse, get advanced motion alerts that reduce false alarms, and create Activity Zones to keep a closer eye on designated areas. You get a free 30-day Nest Aware trial when you purchase a Nest Cam; it starts as soon as you add the camera to your Nest account.

### Setup and usage

The Nest Cam offers two painless setup options: via the Nest app on a Bluetooth LE-capable smartphone or tablet, or through the Nest website on a Mac or Windows computer. Using the app method, you'll be required to scan the QR code on the back of the Nest Cam with your device; you'll need to connect the camera to your computer via a USB cable to do the website setup. In either case, the Nest setup wizard walks you through the process of adding the camera to your Nest account and connecting to your home Wi-Fi network.

Whereas most of the other security cameras in our guide seem designed to blend in with your home's furnishings, the Nest Cam's all-seeing eye peered conspicuously from wherever I placed it, but perhaps that makes it more of a deterrent to bad behavior, whether by unsupervised children or intruders.

The Nest Cam maintained a strong connection to my Wi-Fi network,



### A slightly upgraded

Dropcam Pro, the Nest Cam boasts improved resolution and a sleeker design.

even when I moved it to an upstairs bedroom (our router is downstairs). Video was crystal clear, even with night vision turned on, and there was only moderate fish-eye distortion at the edges, usually when I placed it in a smaller room where it had a shorter focal length.

The Nest app provides everything you need to manage the camera. Once you select your camera from the home screen, you'll see your live video feed. From this screen you can turn the camera on and off, activate the mic, pinch-and-zoom in on a specific area, and view your history of motion events. From the settings menu you can change the video resolution, turn alerts on an off, and schedule the camera to automatically turn off at specified times or just when you're home.

If you have a Nest Aware account, this is also where you'll be able to set your activity zones, create video clips, and use other advanced functions. You can also control these features from the Nest web client.

Motion detection was pretty sharp in my tests. When the camera was trained on the center of my living room, the sensor was triggered only if a body—human or non-human—moved. It never sent alerts for incidental motions such as a fluttering curtain or leaves blowing in the breeze outside my patio window.

Sound detection was less predictable. While it paid no mind to the air purifier and fan running in my living room—proving Nest's claim that it learns to filter out unremarkable noise—it also didn't react to a loud hand-clap or to my moving items around on a table. But it was triggered by a cough.

I found the app could be a bit buggy at times. Frequently when switching back to the live feed from another screen, it wouldn't show an image

## Nest Labs Nest Cam

### AT A GLANCE

Nest Cam doesn't improve much on the Dropcam Pro, but it doesn't need to. It's an excellent camera if your serious about home security.

### PROS

- Sleek, sturdy construction
- Accurate motion detection
- Easy-to-use app

### CONS

- Nest Aware subscription required to access most security features
- Sends alerts only once every 30 minutes
- Weak sound detection

\$199



## Roundup: Security Cameras

or I'd get a message saying the camera wasn't connected, even though it was. Each time the issue resolved itself within several seconds, but it could be disconcerting if you get notified of a real-life event and just want to see what's going on at home as quickly as possible.

More potentially troubling is the 30-minute delay between notifications. Nest says this is by design, to prevent customers from being overwhelmed. While I certainly appreciated not being bombarded with alerts every time my dog or cat walked in front of the camera, it did raise the question of what would happen if, say, pet movement triggered a notification, and then moments later someone broke in to the house. Admittedly, this is a pretty unlikely scenario, but still it seems like notification intervals of every 10 to 15 minutes would be more prudent, if only for peace of mind.

The Nest app provides everything you need to manage the camera.

### Bottom line

If you're already using the Dropcam Pro, the Nest Cam's improvements probably aren't significant enough to warrant an upgrade. Viewed on a smartphone screen or on the web, the difference between 720p and 1080p is barely noticeable, particularly on surveillance footage. If you're looking to buy your first Wi-Fi security camera, however, Nest Cam's sleek, sturdy design; impressive video quality; and easy-to-use app place it near the top of the heap.

If you also own a Nest Learning Thermostat and a Nest Protect smoke and carbon-monoxide detector, deploying a Nest Cam lets you integrate all three devices. The Nest Cam can relay a message to the thermostat that you've arrived home before you walk past the thermostat's motion detector, for instance. And if the smoke alarm goes off, it can trigger the camera to snap a picture that might identify the source of the flames.

Just bear in mind that without the features a Nest Aware subscription brings, the Nest Cam is little more than a webcam. The subscription adds substantially to the cost of ownership, but it's a worthy investment if you're serious about home security. 🔌

# Netatmo Welcome: This camera promises personalized security, but its facial-recognition feature falls short

BY MICHAEL ANSALDO



**MOST WI-FI SECURITY** cameras are designed to look for people who aren't supposed to be in your home. The Netatmo Welcome ([netatmo.com/product/camera](https://netatmo.com/product/camera)) is made to look for the people who are. The smart appliance manufacturer built this \$199 camera around facial recognition and a personalized notification system that seeks not only to reassure you of your loved ones' safety, but to improve its ability to distinguish between real security incidents and false alarms.

In the real world, however, the Netatmo struggles to get to know your family, and it's missing many of the features that other cameras in its price range deliver.

# Roundup: Security Cameras

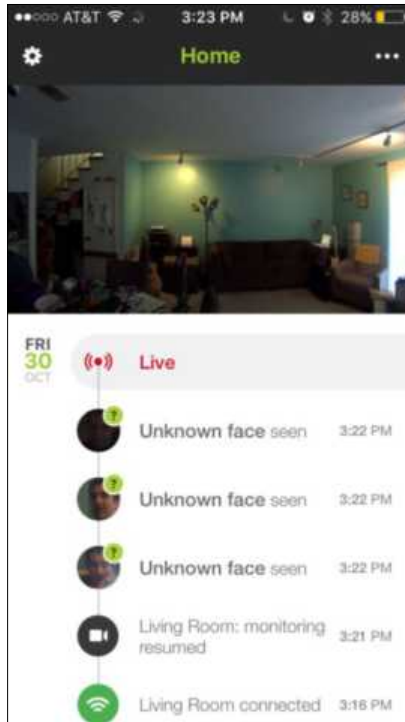
## What you get

The Netatmo Welcome looks nothing like a home-security camera. The indoor/outdoor device is housed in a tall, thin aluminum cylinder with a metallic finish much like its sister product, the Netatmo Urban Weather station. The design makes it blend easily with other knickknacks in your home, and it reduces that feeling of Orwellian dread more-conspicuous security cameras can produce in your family and guests.

Netatmo Welcome must be plugged in to a power outlet as it doesn't have a battery backup. The camera also has a USB port, so you can connect it to a computer, and though it's designed for Wi-Fi, it includes an Ethernet port if you prefer a wired connection.

The camera's 1080p streaming, 130-degree field of view, and infrared LEDs for night vision put it on a par with the Nest Cam, but that's where the similarities to the current gold standard in home-security cameras end. The Netatmo Welcome detects motion, but not sound; and it has no two-way audio for remote communication.

Its marquee feature is facial recognition that can distinguish up to 16 people. Once the Netatmo Welcome "learns" faces, you can customize the alerts triggered by each individual. Ostensibly, this is so you can keep tabs on children and



**The Netatmo Welcome's**  
1080p live video is crystal clear, but the camera has a tough time recognizing faces it should know.

elderly parents, but it should also help cut down on false alarms when a “known” person passes in front of the camera.

Unlike most other home-security cameras at this price point, the Netatmo Welcome doesn’t support any cloud recording plans. Instead, all video is recorded locally to an included 8GB SD card that slots into the back of the camera. The benefits of this setup are obvious: It eliminates the cost of monthly storage fees, and keeps the security of your video in your hands. But it also means that if an intruder takes your camera, you lose all forensic evidence of the break-in.

## Setup and usage

The Netatmo Welcome had one of the easiest setups of any camera I tested. Other than the peculiar requirement to turn the camera upside down for the duration of the setup process, there was nothing remarkable about adding the camera to my Netatmo account and home Wi-Fi network. The Netatmo Welcome mobile app (there’s no web option) walked me through the steps and the whole operation was completed in less than two minutes.

Netatmo doesn’t include any wall-mounting or magnetic accessories, so you’re limited to placing it on flat surfaces. I positioned it on our living room entertainment center one bustling school morning, and within minutes it was sending regular motion alerts.

It also immediately started trying to recognize faces. When I first opened the app, the home screen presented me with a series of snapshots of myself and each of my family members, each with a question mark next to it identifying them as unknown faces. Each of these snapshots represented an event where the camera picked up human features. Tapping on a face takes you to the video clip of the triggering event. Long-pressing a face allows you to identify that person.



**The Netatmo Welcome’s** unique design makes it less conspicuous on your shelf or mantel.

## Roundup: Security Cameras

When you start the face-identification process, you're presented with three options: Identify, Forget This Person, or Not A Face. As the camera never recognized my dog or a lamp as a face, I never had to use the last one. Selecting Identify gives you two choices: Build A New Profile or Correct The Camera (if it didn't recognize someone it should have).

Building a profile allows you to name the person and add a photo, either the snapshot taken by the camera or a different picture. If there are multiple shots of the same person marked as identified, you can add each one to that person's profile. This will help increase their "profile strength," represented by a meter of one to five bars that indicates how well the Netatmo system knows them.

Based on my usage, building that strength takes time. The system learns to better recognize a face as it's increasingly exposed to it at different angles and in different lighting. I also had to do a fair amount of correcting the system when it marked a previously identified face as unknown. According to Netatmo, it can take a couple of weeks to build a full-strength profile. But considering it "learns" primarily by capturing fuzzy images of people in motion, it's tough to imagine its recognition will ever be as foolproof as we'd like.

All recognized faces are designated as either Home or Away. Anytime the camera sees a face, that person is identified in the app as being home. "Away" is a misnomer; the system says a person is away if it hasn't seen them for a certain period of time, even if they're actually home but out of view of the camera. The default is four hours, though you can change this in the app to be anywhere from one to 12 hours in 15-minute intervals.

You can also personalize settings for each person in their individual profile. By default, you will receive notifications for each person when they arrive home, but you can turn this off. You can also set a time range for when you want to be notified, say between 2:30 and 3:30

The point of face recognition is obviously to make sure the camera understands who should be in your home and who shouldn't.

p.m. when your kids usually arrive home from school. Recording parameters for known faces are also set here: You can have an individual recorded Always, Never, or Only On Arrival.

The camera's included SD card can reportedly hold up to 100 clips and delete them, starting with the oldest video, when it nears capacity. Given that the camera only records when it detects an event, it's

unlikely you'll fill the card quickly; but you can always swap in a new card if you do. Just be aware that each time you take a card out, the camera loses its memory of who's who, and you'll need to retrain it to recognize all those faces.

The point of face recognition is obviously to make sure the camera understands who should be in your home and who shouldn't. But the system offers several customization options for dealing with the latter as well.

You can tell the Netatmo Welcome to always record unknown faces or only when no one is home. You can also choose to record and/or be notified of motion detection Never, Always, or Only When Nobody Is Home.

The camera's live-feed screen is similar to that of other home security cameras. A video window sits on top of a time line of motion and face events. Pressing an event takes you to video of the incident. Live video is exceptionally clear

## Netatmo Welcome

### AT A GLANCE

The Netatmo Welcome shows promise with its facial recognition and personalized security features, but the camera and its app need more work to catch up to the competition.

### PROS

- Easy to set up
- Able to personalize security settings for individuals
- Strives to make the home-surveillance experience less creepy

### CONS

- Facial recognition is hit-and-miss
- Lacks many key security features
- No cloud-storage option

\$199





## Roundup: **Security Cameras**

with no fish-eye distortion in either day or night modes. There's no digital zoom feature, though, so you can't hone in on specific areas of the panorama. Video playback is crisp and smooth.

Aside from managing profiles and recording settings, the app can be used to turn the camera on and off. You can set a four-digit security code for accessing the on/off switch to ensure unauthorized people can't deactivate your camera.

### **Bottom line**

The Netatmo Welcome gets points for trying to make the home-security experience more reassuring than alarming. Everything from the product's name to the extensive personalization options seeks to remove—or at least to downplay—the creepy surveillance aspect of home monitoring. Unfortunately, the system's lynchpin—facial recognition—is far from reliable and results in exactly the kind of vague alerts it promises to eliminate.

Add to this the fact that the camera lacks many common home-security camera features—including sound detection, two-way audio, and cloud backup—and it becomes a really tough sell, especially compared to such stronger competitors as the Nest Cam and the SimpliCam. 🔌



*"I want  
to be  
a bench.  
Recycle me!"*



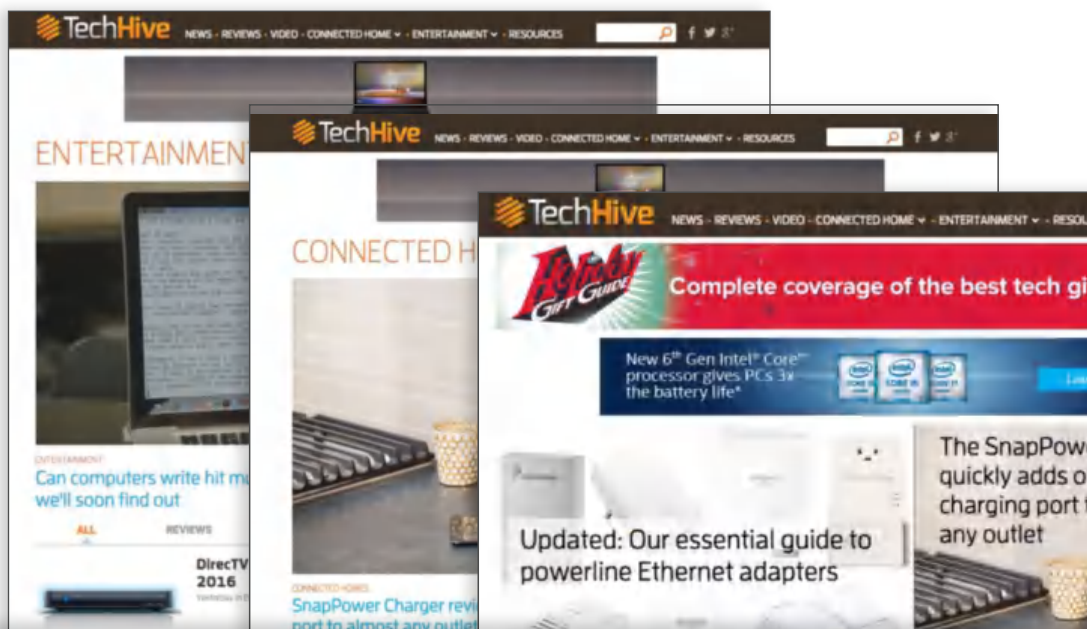
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# THIS OLD Tech:

The Toshiba T1000 was my first step into the world of MS-DOS **By Benj Edwards**





**WELCOME TO** *This Old Tech*, a new column devoted to vintage gadgets, electronics, computers, and video games. By *vintage*, I mean things that are generally at least 10 to 20 years old or otherwise obsolete. Most people throw this stuff away, but I know I'm not the only one who likes to keep the tech and their stories alive. I'll be starting with a classic Toshiba laptop that served as my entry point into the world of primordial computing.

But first, a bit about me: I've been writing about vintage computers and classic video games for the past decade, first for my blog ([vintagecomputing.com](http://vintagecomputing.com)) and later for many other publications ([benjedwards.com](http://benjedwards.com)), including *PCWorld*.

I started collecting old computers and video games as a teen. After 20-plus years—eons in tech time—my large collection (including associated media, accessories, and literature) fills a good portion of my garage. I also have a lot of old books and magazines—perhaps too many, as you may come to find out later.

It's been an amazing privilege to play host to this mass of historical artifacts, but it's also been tough keeping all of it from decaying into a

**This is what**  
a garage full  
of old tech  
looks like.

pile of moldy rubber and steel. Thanks to hours of tinkering and research just to keep everything alive, I developed a deep practical knowledge of computer and tech history. I'll share that with you as I dig into boxes and pull things from shelves for this column.

The invention of the digital computer will drive this column, but the computer (specifically, the microcomputer) has been incorporated into so many different types of products that my topic possibilities are nearly endless. So I'll be covering video games, cell phones, and calculators, as well as various computers. I also may go into the technologies that made modern gadgets possible, such as the QWERTY keyboard on a typewriter.

What better way to start than with my first experience with an IBM PC-compatible machine: the Toshiba T1000.

## A TASTE OF TOSHIBA T1000

When I was a kid, IBM PC-compatible computers seemed impenetrably complex and daunting. As I watched my father use one at work, I often

**The Toshiba T1000** was small enough to fit into a briefcase.





wondered, “How does he type so fast?” And most importantly: “How does anybody know what to type into the little blinky prompt to make it work?”

Enter the Toshiba T1000 laptop, circa 1989. My older brother taught me how to insert a floppy disk with *Tetris* on it, turn it on, type **DIR**, then type **TETRIS** to run the program. As mundane as it sounds now, it was a transformative experience for an 8- or 9-year-old kid. (I had previously played around on an Atari ST and a Mac SE, so I had the mouse down pat. But a command prompt? That was serious business.)

In 1987, Japanese firm Toshiba delivered the T1000, a 6.4-pound version of the IBM PC that could fit comfortably inside a briefcase and run on batteries alone for four to five hours a charge. It retailed for \$1,199 in the United States and included a 4.77MHz 80C88 CPU, 512K of RAM, a 720KB 3.5-inch floppy drive, and a 640x200 EGA-capable monochrome LCD.

At the time of its release, critics hailed the Toshiba T1000 as a groundbreaking innovation. It was the lightest PC-compatible laptop

**The Toshiba T1000**, with its lid and top cover removed.

ever released up to that point, and the press considered it the MacBook Air of its day.

Like the MacBook Air, the T1000 shipped with a solid-state disk: It packed MS-DOS 2.11 on a built-in ROM chip so it would be available instantly when powered on. For \$549 more, you could increase the RAM to 768K, and use a portion of that memory as an ultra-fast RAM disk that retained its data as long as the main system battery didn't discharge.

My dad apparently bought that 768K option when he got his T1000 around 1989, because I just ran across it today. It's a tiny board plastered with RAM chips plugged into the motherboard. Here's how it looked:

I took apart the T1000 because it doesn't boot anymore. It has seen better days. The plastic has yellowed, and there's unidentified gunk on the lid.

**This Toshiba T1000** had a rebuilt Ni-Cd battery pack (thank you Radio Shack!)





After a few years' service as a personal machine for my family, this T1000 began its second life as a glorified serial terminal at my dad's electronics company, where it was hooked to some sort of test machine for the next decade.

After his company retired the T1000, I rescued it and added it to my collection.

My dad passed away in 2013, so I can't ask him for more specific details about the history of the machine. But it's amazing how the stuff he touched and used provides tangible links to him in ways I don't expect.

## AN ASSIST FROM RADIO SHACK

For example, upon disassembling the T1000 today, I found out that at some point the unit's internal Ni-Cd battery pack had been rebuilt—

**Luckily the Toshiba T1000** has a composite video output, so when its own display didn't work, an old Apple IIc monitor could be called into service.



likely by my dad. It's a clutch of four Radio Shack rechargeable cells, soldered together and wrapped in foam rubber and electrical tape.

(I'm very lucky this pack did not leak and ruin the T1000's motherboard. Batteries are the bane of most computer collectors, as their acid eats away at circuitry.)

Upon seeing that rebuilt battery pack, a vague memory flashed: I think I remember when he built it. Tinkering definitely ran in my family.

After clipping out the old battery pack, I rigged up a 7-volt VPX lithium-ion battery pack from one of my dad's old cordless drills. After a few smelly burps of ancient capacitors settling, then stirring to life, the unit powered up again for the first time in over 15 years.

Then I smelled something alarming: burning capacitors.


As electronics age, the second components to fail (after batteries) are usually electrolytic capacitors, which break down over time and either deform or leak. It's a big problem.

A small puff of smoke accompanied the fading-out of the LCD screen. The bad capacitor was located in that assembly.

Luckily for me, the T1000 also supports composite video output, so I hooked it up to an old Apple IIc monitor I have on my workbench.

Can you guess the first program I ran?

*Tetris*, of course.

With a little help from borrowed technology, the Toshiba T1000 lives on to fight another day. I still need to fix the LCD panel, but it's been fun playing that classic again—even if it is rendered entirely in green. 


**Upon seeing that rebuilt battery pack, a vague memory flashed: I think I remember when he built it.**



**“ SURE,  
AT FIRST I WAS A LITTLE TAKEN ABACK  
BY THE WHOLE PEEING STANDING UP THING.  
BUT I TAUGHT HIM TO THROW A STICK  
AND NOW HANGING OUT WITH HIM  
IS THE BEST PART OF MY DAY.”**

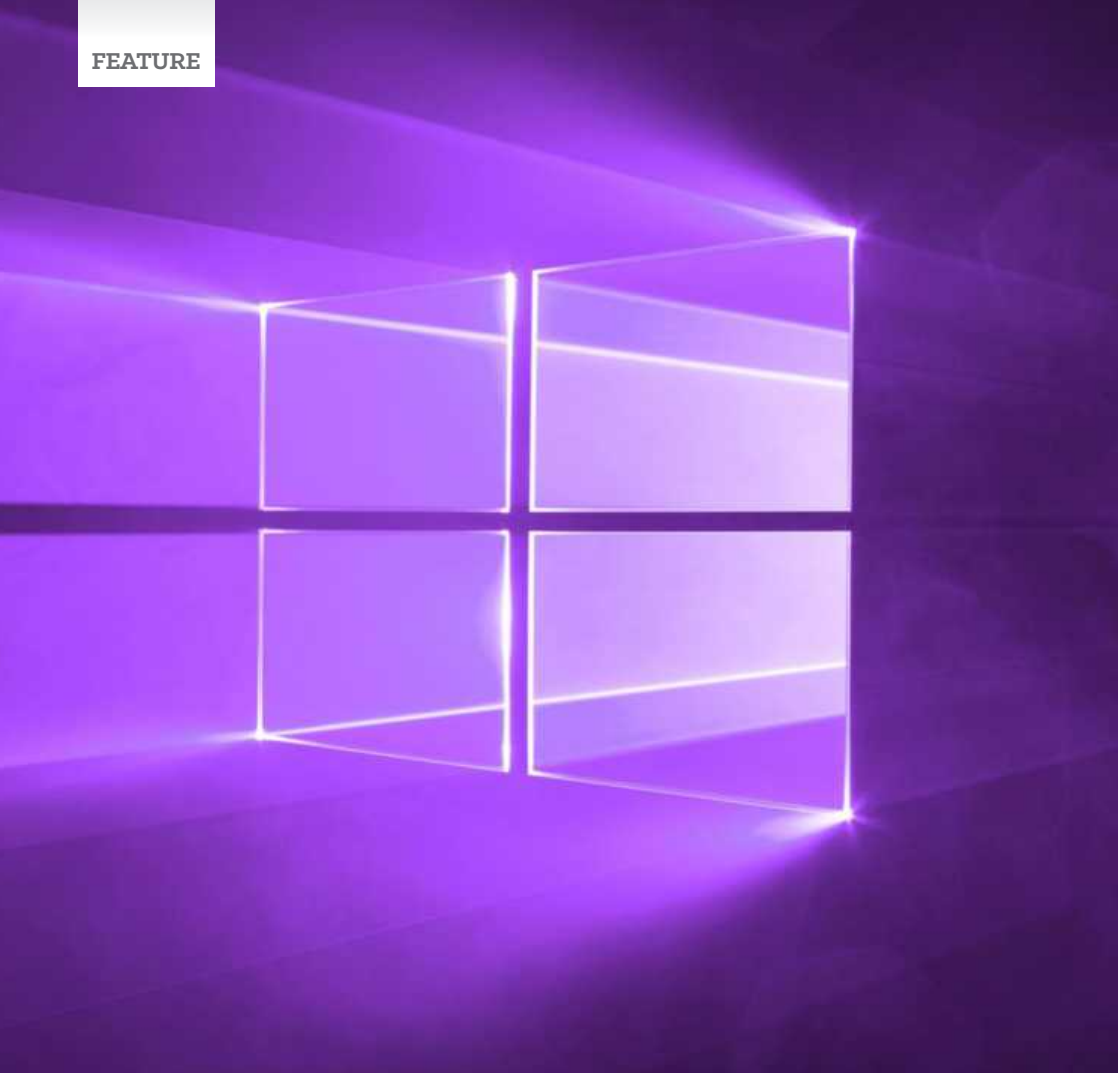
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# Who needs Windows 10 Pro: 5 reasons to upgrade

Most of you should be happy with Windows 10 Home.  
But certain features make the upgrade worthwhile.

BY MARK HACHMAN

## WINDOWS 10

**PROFESSIONAL** isn't just for cubicle dwellers who have no choice in the matter. While users who own a "professional" PC, like the Surface Pro 3 ([go.pcworld.com/surpro3rev](http://go.pcworld.com/surpro3rev)), will automatically be upgraded to this higher-end version of the OS, smaller businesses and PC

enthusiasts, as well as contractors and sole proprietors, may also weigh the benefits of the Pro version versus Windows 10 Home.

Windows 10 Professional doesn't take anything away from Home users; it simply adds more sophisticated features. It's a costly choice, though: \$99 for a Windows 10 Pro Pack that takes you from a licensed copy of Windows 10 Home to the Professional version. This applies to Windows 7 Starter, Windows 7 Home Basic, Windows 7 Home Premium, or Windows 8.1 users, who are only eligible for Windows 10 Home.

Microsoft created a useful webpage for comparing the different Windows 10 versions ([go.pcworld.com/w10bizcompare](http://go.pcworld.com/w10bizcompare)), breaking down the reasons to upgrade to Windows Pro into four categories: the fundamentals, management and deployment, security, and Windows updates. All of them have some relevance for power users and more traditional businesses alike. While there are dozens of differences, five key aspects of Windows 10 Professional will help you decide whether the upgrade is worth it for you.



Windows 10 Professional doesn't take anything away from Home users; it simply adds more sophisticated features.



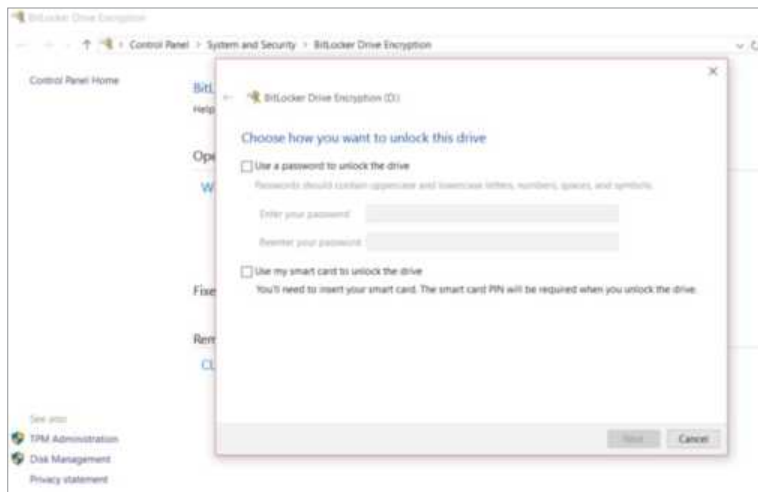
## 1. BITLOCKER

Microsoft's encryption software has been developed and updated since Windows Vista, and it's been built into Windows 10 as well. Since Windows 8.1, BitLocker has offered the option to encrypt the Windows boot drive and other fixed drives within the system, as well as USB keys and external drives.

BitLocker is especially handy for traveling, even if it's just to a local cafe. Locking down your data isn't 100 percent foolproof, but it's a start. If a drive is encrypted, BitLocker will encrypt other files that are added to it. You also have the option to suspend encryption or remove it entirely. Files moved from a BitLocker encrypted drive to another drive are automatically decrypted.

Of course, you'll need a password to make it all work, preferably as strong as possible ([go.pcworld.com/strongpasswords](http://go.pcworld.com/strongpasswords)). If you don't have that password, you'll need a recovery key to regain access: a code that can be saved to a file, to a Microsoft account, or even printed out and saved. But if you forget the password *and* lose the recovery key, you're stuck—you'll lose access to that data forever.

A cloud storage solution like OneDrive can be a great way to store your files, but a USB key encrypted with BitLocker and clipped to a keychain can provide an additional layer of security and keep precious files close at hand.

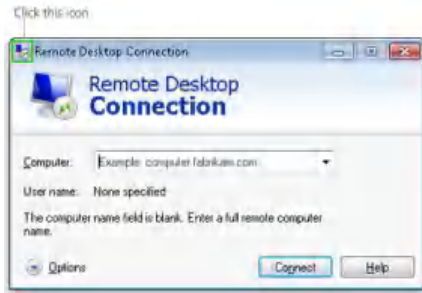


**Encrypting drives is a snap with BitLocker.**

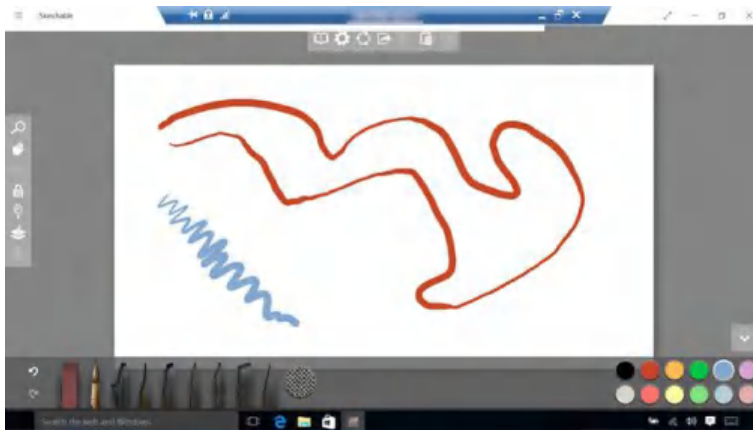
## 2. REMOTE DESKTOP CONNECTION

Windows 10 Home machines and Windows 10 Professional machines can initiate Remote Desktop

Connections, such that the “master” machine controls the “slave” machine and all of its resources. (Doing so blanks the display on the “slave” device.) Only Windows 10 Professional machines can be remotely controlled, however—not Windows 10 Home machines.



**Windows has two** similarly named capabilities: Remote Desktop Connection and Remote Assistance. The differences between the two are significant.



**With Windows 10,** Remote Desktop connections can even use ink as a “first class” input, which means that different levels of pressure are sensed and applied remotely.

Windows 10 Home machines can be remotely *assisted*, which means that the Windows 10 “master” machine controls the “slave” machine, and the “slave” display mirrors the “master” display. Remote Assistance is designed as an educational tool, so that a remote technician can show you how to adjust your graphics settings, for example, by moving your mouse.

The upshot is that work machines can be accessed from home, but home machines can be controlled only from work. If you run a small business, Remote Desktop Connection is another reason to consider Windows 10 Professional.

### 3. CLIENT HYPER-V

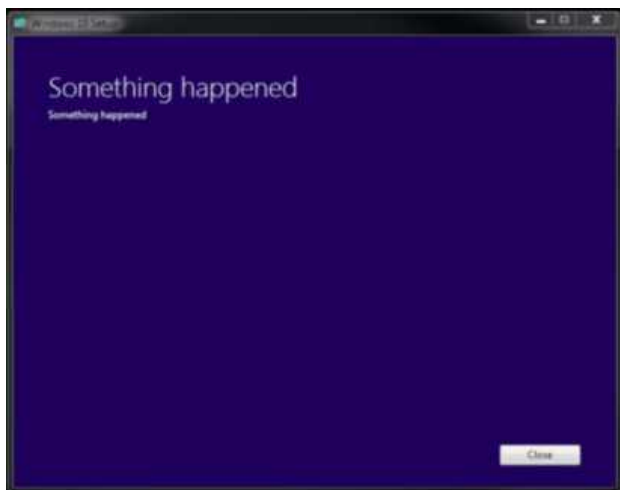
Not many business professionals will probably care about virtualization, the ability to wall off a portion of your hard drive into a virtual PC, complete with its own operating system. But for enthusiasts—especially those who wish to continue testing Insider builds without risking their main system—Hyper-V is just the thing.

Virtualization creates a secure operating environment within your PC that allows you to run different operating systems, including Linux, future builds of Windows 10, and even older versions of Windows. (Just make sure you still have valid license keys for the operating system and a PC processor that supports virtualization—not all older models do.)

Once you have Windows 10 Professional, you'll still have to install Hyper-V manually. You can begin typing **Hyper-V** in the Search box. Windows will suggest that you install some optional features. You'll be given a list of options, where you can install Hyper-V. Our sister site Infoworld offers a great introduction to Hyper-V ([go.pcworld.com/hypervintro](http://go.pcworld.com/hypervintro)).

### 4. MICROSOFT UPDATE FOR BUSINESS

Windows 10 Home pushes patches to your PC ([go.pcworld.com/w10update](http://go.pcworld.com/w10update)) immediately, allowing you to defer installation for a few hours, but no longer. For some, that might not be the most desirable option. Windows 10 Professional offers an option.



**This bug cropped** up in some installations using the Windows 10 Media Creation Tool.



Before Windows 10 launched, I would have argued that enthusiasts would want to remain on the Windows Insider branch, testing out new patches as quickly as possible. Even small business owners wouldn't mind using Windows 10 Home, I thought, as who wouldn't want to receive the latest patches as quickly as Microsoft could deploy them?

And then, as Windows 10 neared, reports circulated of new updates breaking multimonitor setups with certain Nvidia cards. A firmware update that Microsoft pushed to the Surface 3 and Surface Pro 3 failed, and had to be reissued. And by default, Windows doesn't tell you that updates or patches need to be installed.

Part of the issue is a fundamental conflict between hardware makers and Microsoft. Microsoft thinks the latest drivers should be routed through its own servers, while hardware makers reserve that right for themselves. That can cause some problems around which drivers are considered "the latest."

In other words, patches do occasionally cause things to go haywire, which means that Home users could wade through some wonky updates as Windows 10 evolves. Murphy's Law says things will go wrong. Bugs will happen. Updates will be applied. If you're a conservative type, Windows 10 Professional lets you defer updates for up to several months (security updates excepted). That chance to wait and see if anything blows up might add an extra layer of peace of mind.

If you're a conservative type, Windows 10 Professional lets you defer updates for up to several months (security updates excepted).


## 5. FEATURES FOR BUSINESSES FIRST

Several features in Windows 10 Professional are aimed squarely at the business market. Domain join, for example, allows you to bring in your own PC and connect it to the office domain. Group policy management allows an IT admin to control which PCs do what. And if

you're running an ancient Web app at work that doesn't work with Edge or Internet Explorer 11, the Enterprise Mode Internet Explorer allows you to drop into an Internet Explorer 8 mode inside your browser. Likewise, if your business needs specialized enterprise apps, an admin can lock down the Windows Store to make sure employees get those, and nothing else. There's also the ability to join Azure Active Directory, with single sign-on capabilities.

Some users *may* find some value in Assigned Access, which takes a Windows tablet and allows it to run only a particular application. Normally this setup is used for a dedicated kiosk, but it might kid-proof a tablet, too.

## GET IT FOR THE FLEXIBILITY

Moving to Windows 10 Professional makes sense for people who could use its more-advanced features. It costs money, though, so don't feel compelled to upgrade unless you really need them. Windows 10 Home will suffice for the majority of individual or family users. 



# EXPLORE THE FAR CORNERS OF THE GALAXY AND FIND YOURSELF.

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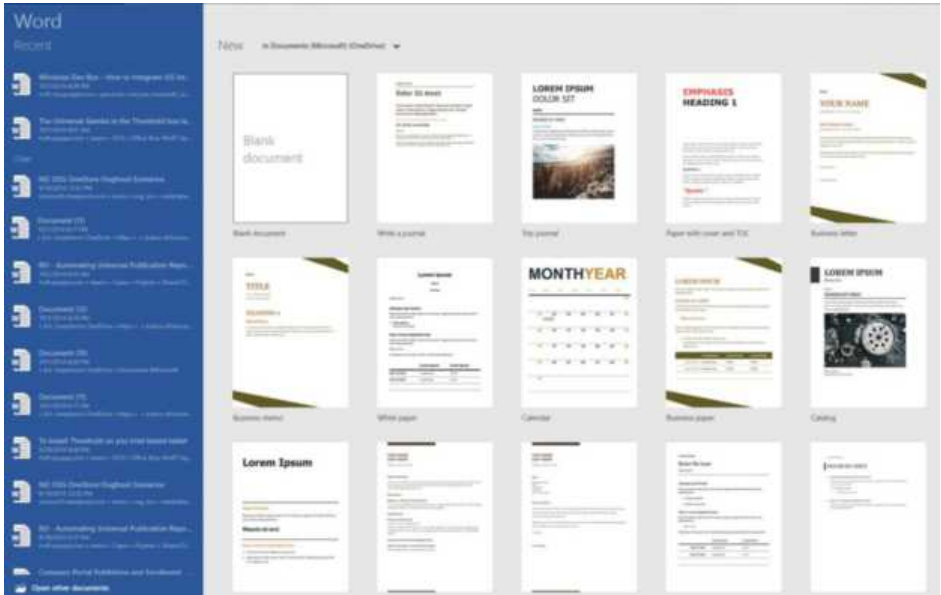
Teachers today take learning far beyond the four walls of the classroom, transforming old lessons into interactive experiences, and discovering what it means to make more. **Teach.org**



# HERE'S HOW

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## Word tips: Random text, quick definitions, formatting tricks, and more

Make it easier to format and read long Microsoft Word documents (and shorter ones) with these tips.

BY JD SARTAIN

**MICROSOFT WORD HAS** many, many tricks up its sleeve. The seven here will help you through some common snags in complex documents.

## Quickly change Line Spacing

You can change the line spacing on a single paragraph, page, or the entire document in two easy keystrokes. Place your cursor anywhere on the target paragraphs, then press:

Ctrl+1 to change the line spacing to single spaced.

Ctrl+2 to change the line spacing to double spaced.

Ctrl+5 to change the line spacing to 1.5 (or one and a half spaced).

Note: You must use the numbers above the alphabet keys. This shortcut does not recognize the numeric keypad.

**Create random text** with the rand command.

## Rand command

1. To generate random text for tutorials (like this one), graphic designs, and other projects, place your cursor at the beginning of a new paragraph and type:

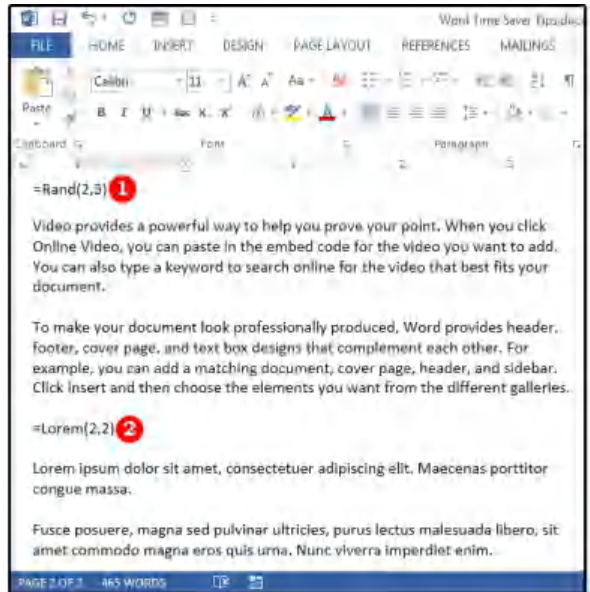
**=Rand(2,3)**

Then press Enter. The first number determines the number of paragraphs, and the second number determines the number of sentences in each paragraph. For example, the following two paragraphs were generated using the **=Rand(2,3)** command.

*Video provides a powerful way to help you prove your point.*

*When you click Online Video, you can paste in the embed code for the video you want to add. You can also type a keyword to search online for the video that best fits your document.*

*To make your document look professionally produced, Word provides header, footer, cover page, and text box designs that complement each*



other. For example, you can add a matching cover page, header, and sidebar. Click Insert and then choose the elements you want from the different galleries.

2. You can also insert the random text in Latin; for example,

**=Lorem(2,2)** looks like the text below:

*Lorem ipsum dolor sit amet, consectetur adipiscing elit. Maecenas porttitor congue massa.*

*Fusce posuere, magna sed pulvinar ultricies, purus lectus malesuada libero, sit amet commodo magna eros quis urna. Nunc viverra imperdiet enim.*

**Use the Define**  
feature for quick  
definitions.

## Quick definitions

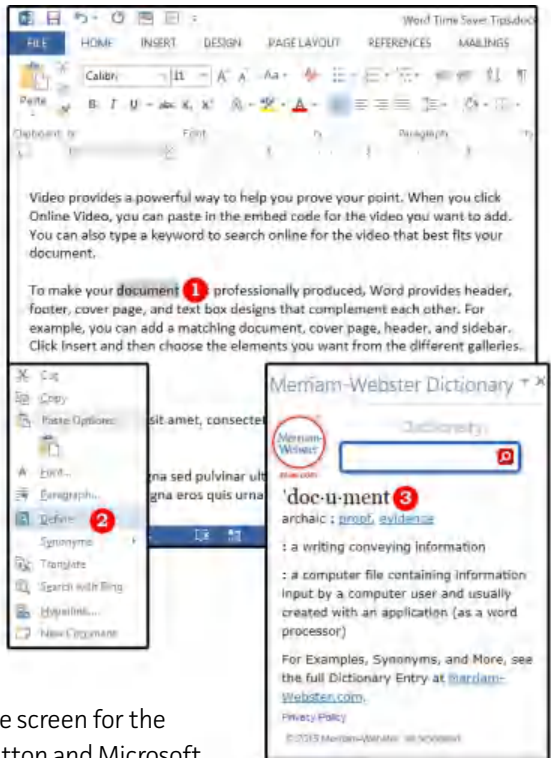
You need synonyms to avoid repetition in your writing, but synonyms can easily stray from the precise definition. The Define feature defines words for you in just two clicks.

1. Place your cursor on any word in your document and right-click once.

2. In the drop-down menu that appears, click Define.

3. A panel on the right opens and displays the selected word with its definition.

If the panel fails to open, then you have not yet selected a dictionary app from the Office Apps Store. From the Insert tab, click the Store button. Choose Reference under Category on the Apps For Office screen. Browse through the Reference apps and select a dictionary, such as Merriam-Webster. The screen for the selected app appears. Click the Trust It button and Microsoft downloads the app to your hard drive. Now, when you right-click a word, then click Define, the Merriam-Webster dictionary appears on





screen in the right panel with the definition of the selected word.

## Expand/Collapse paragraphs

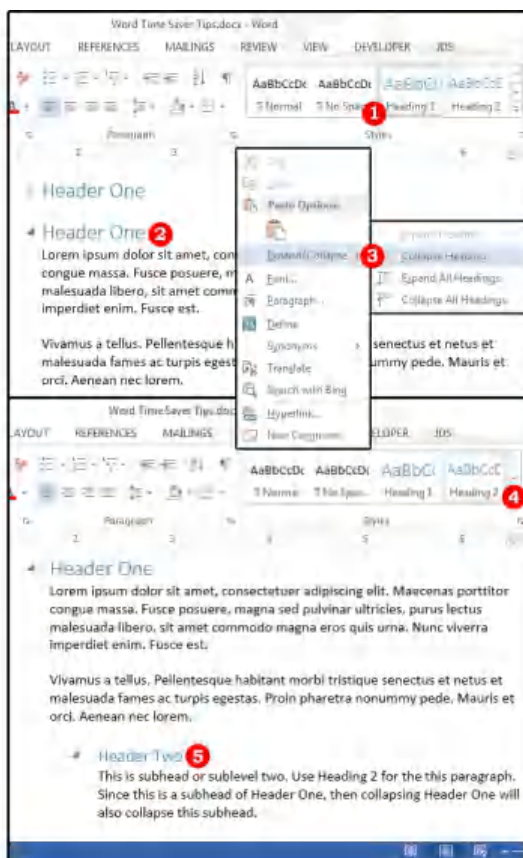
Expanding and collapsing paragraphs makes it easier to browse through long documents. For example, it's easier to skim a document if all the text below the headers is collapsed. It's also easier to read onscreen documents if the paragraphs that you've already read are collapsed. For extremely long documents, especially technical documents and reference materials, collapsed paragraphs are less intimidating for your readers and colleagues.

To set up this feature, you create headings that define sections of paragraphs that can be expanded or collapsed.

1. Type a few paragraphs (or use the **=Rand** command to create some random text). Enter a header over the first two paragraphs, then select it, and choose Heading1 from the Styles group under the Home tab.

2. Enter a few more paragraphs, add another header, then choose Heading1 again. Place your cursor on the first heading. Notice that a solid triangle appears. This symbol means this paragraph is collapsible.

3. Right-click on the first header, select Expand/Collapse > Collapse Heading and the paragraph disappears. Notice the triangle is now clear, which means there are collapsed paragraphs beneath this header.



**Collapse/Expand paragraphs.**



4-5. Any subheadings (such as Heading 2, 3, 4, etc.) under Heading One will also collapse when the main Heading1 collapses.

## Quick Underlines

When you want to run a line across the page, you don't need to press and hold the hyphen or asterisk key and then add or subtract characters until you fill the line. Instead, type a sentence, press Enter, then do one of the following procedures:

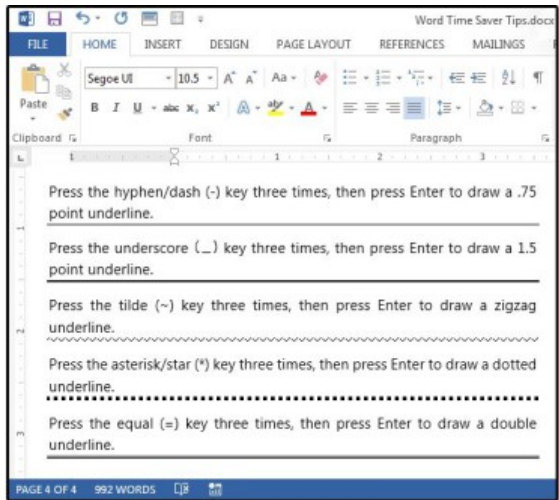
Press the hyphen/dash (-) key three times, then press Enter to draw a .75 point underline.

Press the underscore ( \_ ) key three times, then press Enter to draw a 1.5 point underline.

Press the tilde (~) key three times, then press Enter to draw a zigzag underline.

Press the asterisk/star (\*) key three times, then press Enter to draw a dotted underline.

Press the equal (=) key three times, then press Enter to draw a double underline.



**Quick and easy**  
underlines.

## Easy tricks to rearrange lists

If you have a numbered or bulleted list of items and suddenly decide that number 2 should be number 5 and number 4 should be number 2, most people just cut and paste the listed items until they are rearranged in the proper order. For a short list, no problem. But if you're working with a long list, this can be a real headache.

1. Position your cursor anywhere on the phrase.
2. Press Alt+Shift and hold, then press the up/down arrows to move

the phrase up or down on the list.

3. Now all you have to do is renumber the list.

4. Bullet lists are easier because you don't have to reorder the numbers once the list is reorganized.

## Vertical Selection feature

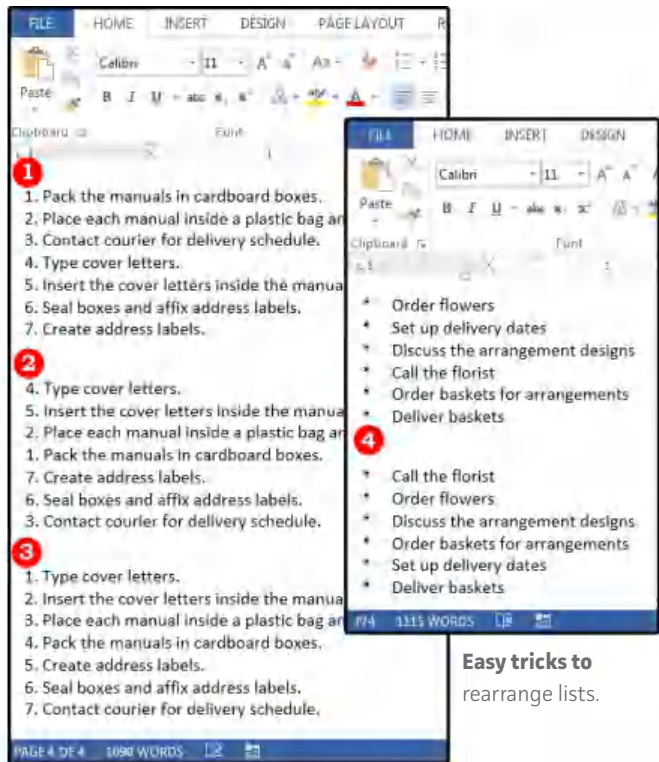
The Vertical Selection feature is a handy tool for making quick changes to a vertical column of characters—for example, adding or removing an attribute such as bold or italics, changing the color, font, and/or size of the numbers, bullets, or text.

You can delete the selected vertical text without also deleting the rest of the text beside it. For example, you can delete the numbers in a list, but not the list.

1. Press the Alt key, then click on the first character in the list or paragraph and drag the highlight down and over through the characters you want to modify, then make the changes.

Note, however, that you cannot sort the vertical characters separately from the adjacent text. You cannot change the design of a bullet through the Insert > Symbol menu, but you can change it through the Font menu or the Bullet menu (with some limitations).

For example, if you select Home > Paragraph > Bullet Library > Define New Bullet > Symbol, then select a “symbol” bullet from the list, only the first item in the list is affected.

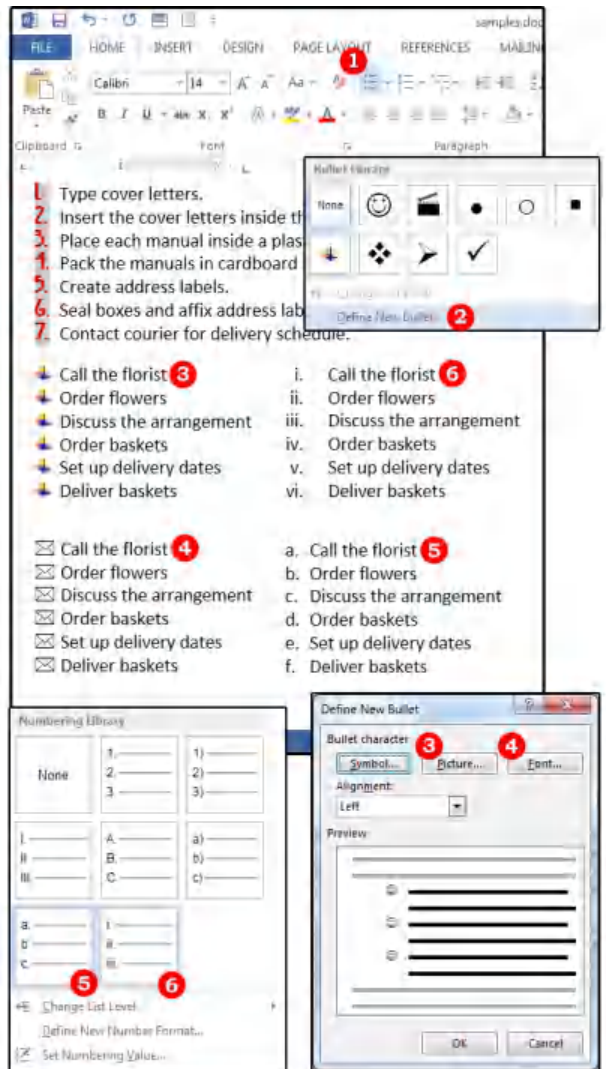


**Easy tricks to**  
rearrange lists.

2. If, however, you choose a bullet from the font option (Home > Paragraph > Bullet Library > Define New Bullet > Font)...

3-4. ...or select a picture from the Picture option (Home > Paragraph > Bullet Library > Define New Bullet > Picture), and the new bullet displays on all the listed items.

5-6. You can also select the Numbering Library, and choose a nice number format for your list, such as all lowercase letters or roman numerals. 📌



**Use the Vertical Selection feature to edit vertical characters.**

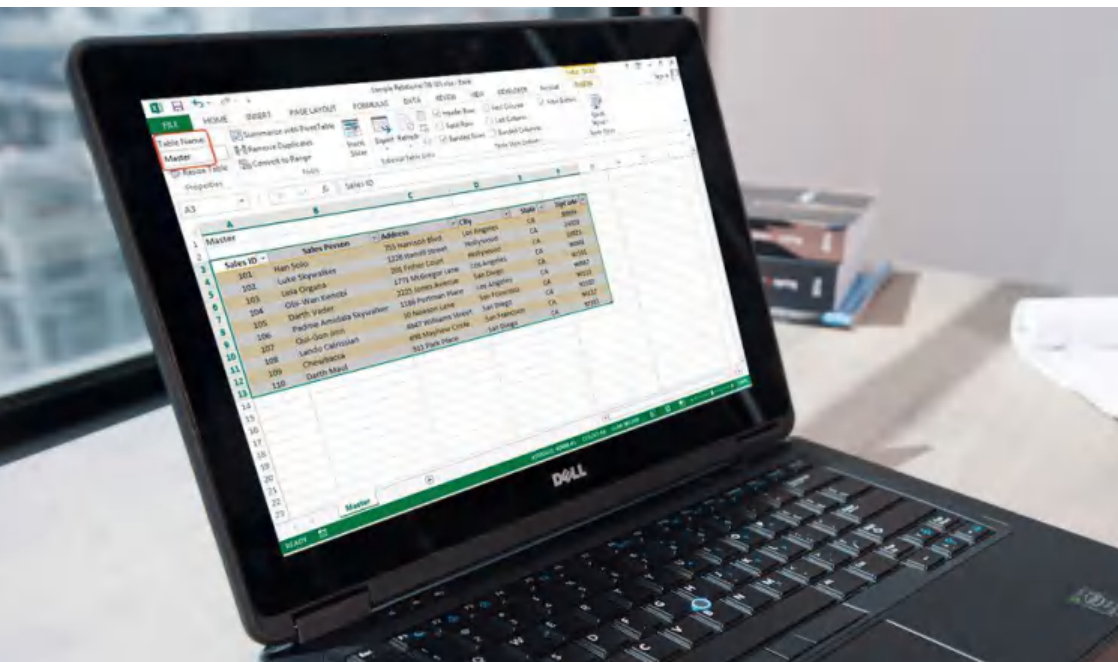


# Plant a Billion Trees

Join The Nature Conservancy to plant a billion trees,  
one tree at a time, in the fight to end climate change  
at [plantabillion.org](https://plantabillion.org)

The Nature  
Conservancy 

Protecting nature. Preserving life.™

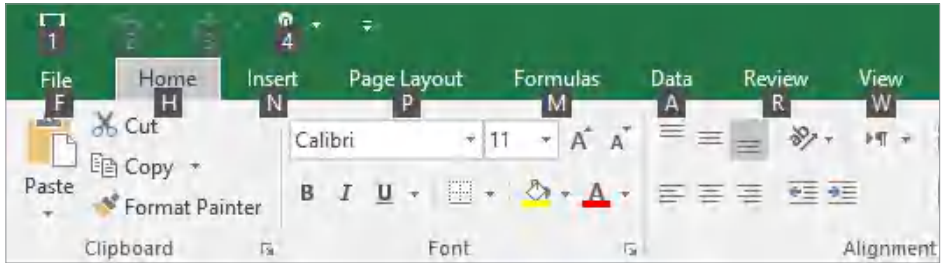


# These 15 Excel keyboard shortcuts will help you become a spreadsheet pro

BY IAN PAUL

**RECENTLY, WE PUBLISHED** a list of 15 Excel functions everyone should know to help you on your way to spreadsheet mastery. If you want to be efficient as possible while using your newfound knowledge, however, it pays to learn some basic keyboard shortcuts.

There are tons of shortcuts for Excel out there—here's a list of 200



for Excel 2013 alone. But trying to learn such a large number can be overwhelming, confusing, and ultimately inefficient.


Instead, we've put together a list of 15 shortcuts that will be immediately useful for most users. This keyboard shortcuts list includes quick ways to format cells, navigate the program, and carry out a few operations.

The list is based on Excel 2016, but most will also work on Excel 2013. When that's not the case, we've noted it.

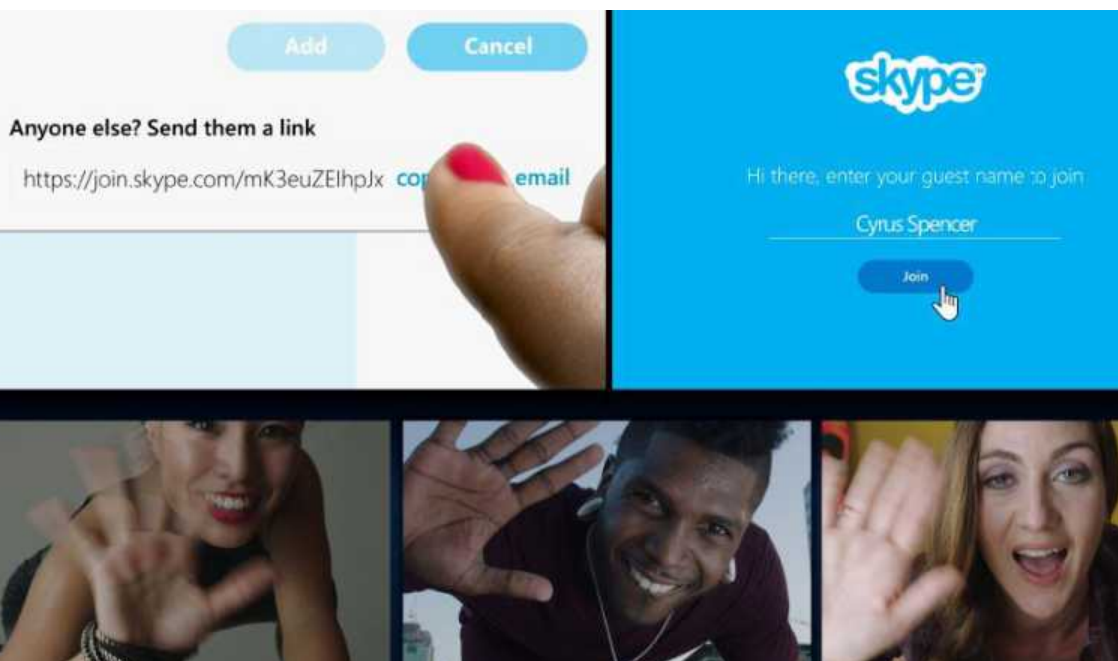
**Key Tips in**  
Excel 2016.

1. **Keyboard access to the ribbon:** Similar to the Vim-inspired add-ons for Chrome and Firefox, Excel 2013 and 2016 have a feature called Key Tips. When Key Tips appears by pressing Alt, the Ribbon menu is overlaid with letters. Pressing a letter launches the corresponding menu item.
2. **Ctrl + PgDn:** Switch between worksheet tabs, moving left to right.
3. **Ctrl + PgUp:** Switch between worksheet tabs, moving right to left.
4. **F12:** Display the Save As dialog.
5. **Ctrl + Shift + \$:** (Excel 2016) Current cell formatted as currency, with two decimal places and negative numbers in parentheses.
6. **Ctrl + Shift + %:** (Excel 2016) Current cell formatted as percentage with no decimal places.
7. **Ctrl + Shift + #:** (Excel 2016) Current cell formatted as date with day, month, year.
8. **Ctrl + Shift + ":** Insert current time.

9. **Ctrl + Shift + “;”**: Insert current date.
10. **F4**: Repeats the last command or action, if possible.
11. **Shift + Arrow key**: Extends your current cell selection by one addition cell in the direction specified.
12. **Ctrl + F1**: Display or hide the Ribbon.
13. **Alt + Shift + F1**: Insert a new worksheet tab.
14. **Ctrl + F4**: Close the current workbook.
15. **Ctrl + D**: Launches the Fill Down command for the selected cells below. Fill Down copies contents and format of the topmost cell in the column.

For more productivity-related software tips check out *PCWorld's* Max Productivity blog ([go.pcworld.com/maxproductivity](https://go.pcworld.com/maxproductivity)). 





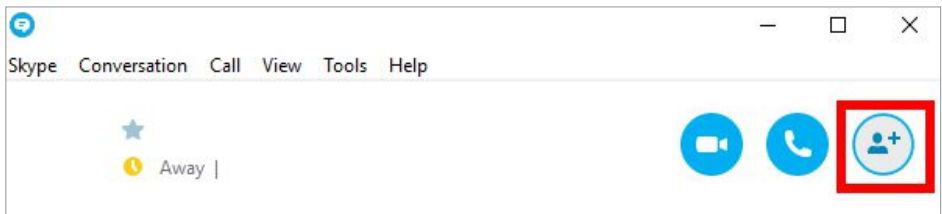
# How to hold Skype chats with people who aren't Skype users

BY IAN PAUL

**RECENTLY, MICROSOFT ADDED** a new feature to Skype that lets anyone join a conversation ([go.pcworld.com/skypeforall](http://go.pcworld.com/skypeforall)) even if you aren't a Skype user. Personally, I'd be hard pressed to find someone I know without a Skype account. Nevertheless, it's a good feature to have ready just in case.

The new Skype feature is available now for U.S. users, but you have to activate it first. There may be a more official way to get it working,





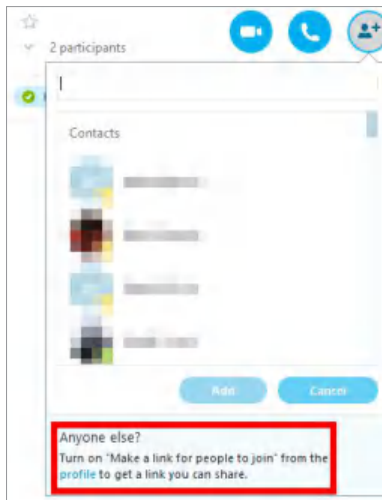
but here's how I did it.

These instructions are for the Windows desktop version of Skype but will work similarly on Skype for the web.

## Get your group on

The first thing you need to do is create a group conversation to trigger the feature's appearance.

Select a contact from your list and double-click to open a chat window. Now, at the top right of the window, click the Add Contact button.



**Click Profile** to enable Skype links.

**Add a second** person to your group conversation to get your first Skype link.

Next, select a second contact and then click Create Group.


Once that's done, click the Add Contact button again—you should see a message at the bottom of the drop-down menu that says “Anyone else? Turn on ‘Make a link for people to join’ from the profile to get a link you can share.” Now click Profile, which will open a new window.

In the new window, scroll down and on the right-hand side under Administrator Settings click the check box next to “Make a link for anyone to join.”

The link will then appear right below that. It will also appear whenever you click on the Add Contact button inside a group conversation.

You only have to do this once and the feature will be available across all conversations.

Let's say you wanted to have a one-on-one conversation with someone who didn't have a Skype account. Once you've activated Skype links, all you have to do is click + New from the main screen and, after a few seconds, a Share link will appear in the new conversation window.

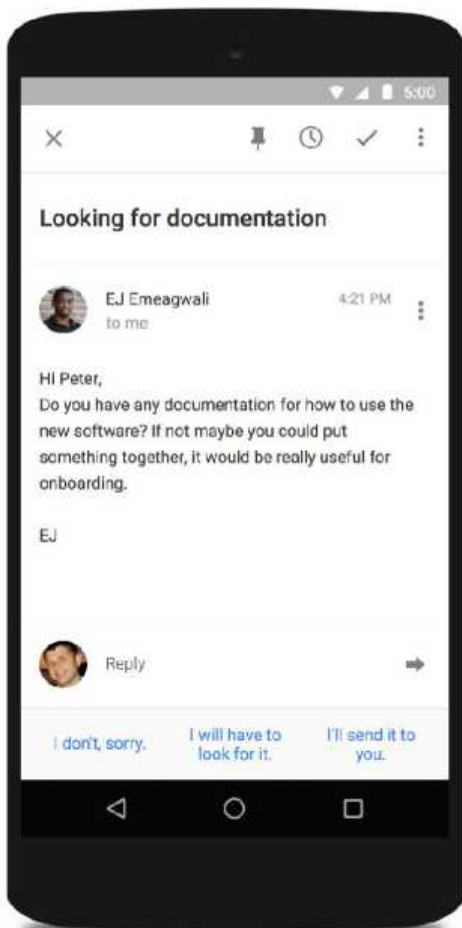
People on the receiving end will be able to log in to the conversation without an account, using Skype for Web on the PC. On mobile, however, they'll need the Skype app and a Skype account. 

# 5 Gmail helpers that make your inbox more productive

BY MICHAEL ANSALDO

**THE BEST INTENTIONS** for a productive workday are usually derailed by email. The pervasiveness of the problem has even prompted some nations to call it an “epidemic.”

But email doesn’t have to be the enemy. With Gmail’s built-in features and some assistance from third-party tools, you can not only get your workflow back on track but transform your inbox into a productivity powerhouse. Here are five you should start using with your Gmail account immediately.



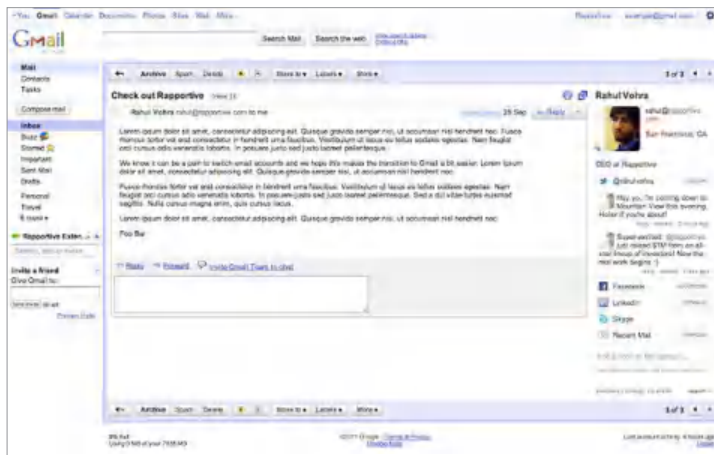
## Rapportive

I'm constantly getting emails from new PR contacts and other industry folks, and this usually prompts me to open a new browser tab to search them out on LinkedIn or elsewhere on the web. LinkedIn's Rapportive ([rapportive.com](http://rapportive.com)) makes ferreting out that information unnecessary by delivering it directly to you.

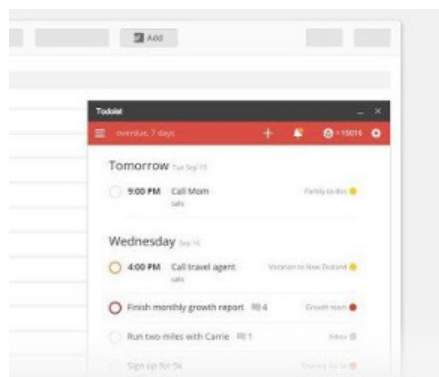
This plug-in replaces Gmail's sidebar ads—which, let's be honest, you're probably not all that interested in—with a comprehensive social profile of the sender. Details include their photo, current job position, and their social accounts including LinkedIn profile. Having these details in an email message not only gives you a more rounded picture of who you're communicating with, it can also facilitate deeper conversations. Best of all, it offers one-click connections on LinkedIn if the contact isn't already in your network.

## Todoist

If you're finding inbox zero elusive, this extension ([go.pcworld.com/chrometodoist](http://go.pcworld.com/chrometodoist)) is just the thing to get you over the hump. It integrates the popular to-do tool ([en.todoist.com](http://en.todoist.com)) with Gmail so you can turn messages into tasks, prioritize actions, and

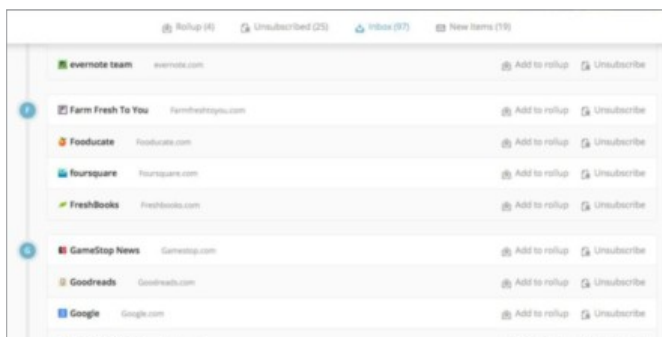


**Rapportive adds the sender's social profile to their messages.**



**The Todoist extension for Gmail turns your email into a task manager.**

assign them deadlines and reminders. The net effect is you process your emails more quickly and get them out of your inbox. And because it syncs across devices, you have no excuse to let your email productivity lapse.



## Unroll.me

If you compulsively sign up for daily deals, newsletters, and other subscription offers only to later wonder why your inbox is teeming with “spam,” Unroll.me ([unroll.me](http://unroll.me)) is a must. Connect your Gmail account to this free service and it will scan your email for subscriptions and compile the senders into a list. All you need to do is click the Unsubscribe button next to each one you don’t want to receive anymore. Those you do still want can be added to a daily digest of messages sent to you at a time of your choosing.

I wrote about my positive experience with Unroll.me ([go.pcworld.com/unrollmereview](http://go.pcworld.com/unrollmereview)) some months ago, and it’s still one of the most powerful tools for managing my inbox.

## Wisestamp

That all-text signature that closes all your emails is so boring, it’s all but invisible to your correspondents. Wisestamp ([wisestamp.com](http://wisestamp.com)) replaces your signoffs with a robust thumbnail profile that includes your photo and icons for your social accounts. In

**Unroll.me lets you** easily get rid of email subscriptions you no longer want and easily digest the ones you do.




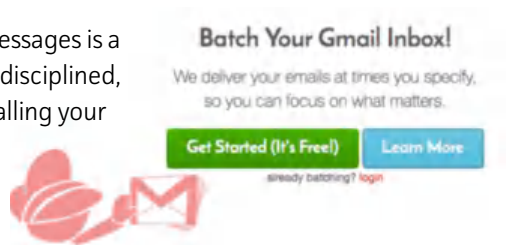
**Wisestamp gives your** email signature a professional polish with a little “pop.”

addition to your contact info, you can add widgets that will show your latest blog post, allow the recipient to schedule a meeting with you or follow you on LinkedIn, and more. Wisestamp offers a range of templates to choose from, and you can even create multiple signatures and add them to different emails.

## BatchedInbox

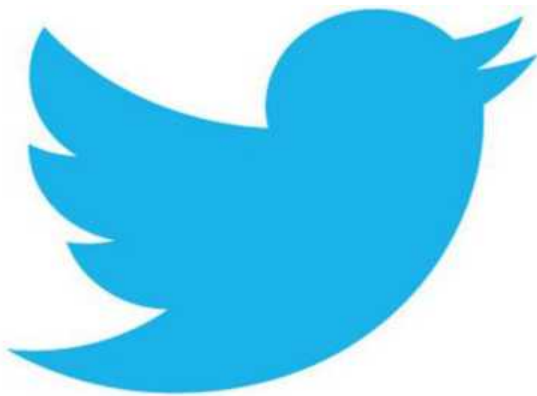
Constantly checking email for new messages is a notorious productivity killer. If you're disciplined, you can designate set times for eyeballing your inbox, but for the weak-willed there's BatchedInbox ([batchedinbox.com](http://batchedinbox.com)).

This tool prevents email interruptions by withholding messages and delivering them in batches either hourly or at times you specify. It does this by diverting your email to a BatchedInbox label, and then moving it to your inbox at the designated times. That means you could sneak a peek, so some willpower is still required for it to work. If there are certain contacts whose email you want to receive immediately, you just need to create a new filter from those addresses, and you can disable BatchedInbox at any time. If you find the allure of new email hard to resist, connect your Gmail account now. 





# This Chrome extension banishes Twitter's new hearts and brings back the stars



**LAST MONTH, A TRAGEDY** befell the Internet that drastically changed how we interact with one of the most beloved social networks in the world. Yes, I'm talking about Twitter's radical shift from representing favorites with a star icon to representing likes with a heart. And shortly I'll explain how you can get your stars back and hold back the winds of change.

Twitter said in a blog post ([go.pcworld.com/twitterhearts](http://go.pcworld.com/twitterhearts)) that it decided to go with the heart because it is a "universal symbol that resonates across languages, cultures, and time zones." Twitter even went so far as to say that in their tests "people loved it."

That wasn't the case for everybody, however.

Debate over the shift from star to heart was swift, with many Twitter veterans crying over the loss of the star. People added the star to their profile names and debated the implications of favoriting versus liking a tweet. One New York Times reporter was so skeptical about the change that Twitter's CEO stepped in to soothe the reporter's pained heart (see what I did there?).

Well, that was then. Now, anyone who can't accept Twitter's hearts can return to the old school stars, at least on Chrome. A quick and easy Chrome extension called Fav Forever ([go.pcworld.com/favforever](http://go.pcworld.com/favforever)) lets die-hard star fans return to the old way of doing things.

Once you install the extension it may take a few refreshes until the hearts are banished from whence they came.

Fav Stars doesn't just return the star to its (purportedly) rightful place. Your notifications tab will also show people *favoriting* your posts instead of liking them.

Unfortunately, Fav Star's little lie only affects the web version of Twitter. On mobile, you'll still have to deal with the hearts of millions of Twitter users unless you can find a third-party client willing to fight the good fight for a starry future. 🔌



**Twitter's** new heart icon in action.



**Twitter.com** on Chrome with Fav Forever installed.





# How to stop Windows 10 from saving files to OneDrive



If you don't watch out, Windows 10 will put your documents, music, and photos automatically into its cloud service.

***Joyce Shue bought a new computer running Windows 10. After transferring data files from her older PC, she discovered that “it placed all my files and folders in OneDrive. How can I transfer these files and folder back to my PC?***

**JOYCE USED LAPLINK'S** PCMover ([go.pcworld.com/laplink](http://go.pcworld.com/laplink)) to move her files, but I doubt it was that program's fault. I simply dragged and dropped, and my data files also ended up in OneDrive (this was in a new Windows 10 environment; not an upgrade). I get the impression that Microsoft wants you to store your data in the company's cloud-based storage service. Given that the company recently reneged ([go.pcworld.com/onedrivelimited](http://go.pcworld.com/onedrivelimited)) on its promise of infinite OneDrive

space—and of 15 free gigabytes—the more you store there, the sooner you'll hit a paid tier.

If you prefer to stay local, you need to do two things: You have to move the files back to the traditional library folders. And you have to change some settings to avoid this problem in the future.

First, you need to unhide your data libraries. In File Explorer, select View > Navigation Pane > Show libraries.

Next, go to and expand the Libraries section in File Explorer's navigation pane. You'll find it below This PC.

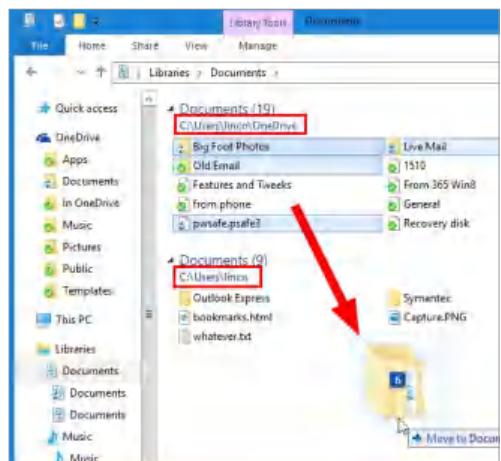
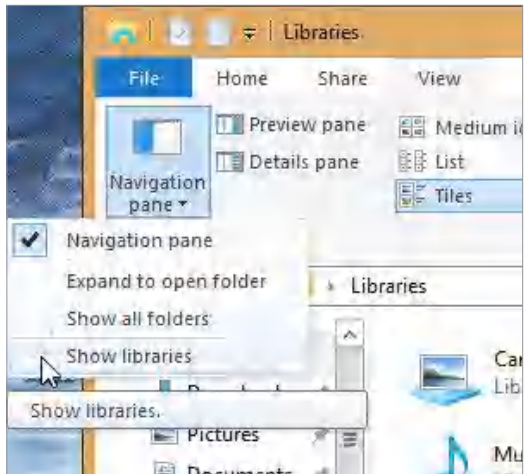
Click Documents under Libraries. The files and folders displayed will be clearly divided into two sections. One of them, probably the first one, will have the name OneDrive in its path.

Drag your files and folders from the OneDrive section to the other one.

If you used OneDrive at all before moving to this computer, make sure you don't move anything that you actually want to keep in OneDrive. As a general rule, don't move any Internet Shortcut files.

Your files are now stored locally and only locally. But you need to make sure this doesn't happen again.

Right-click Documents in the Navigation pane (I'm referring to the Documents library, not any of the

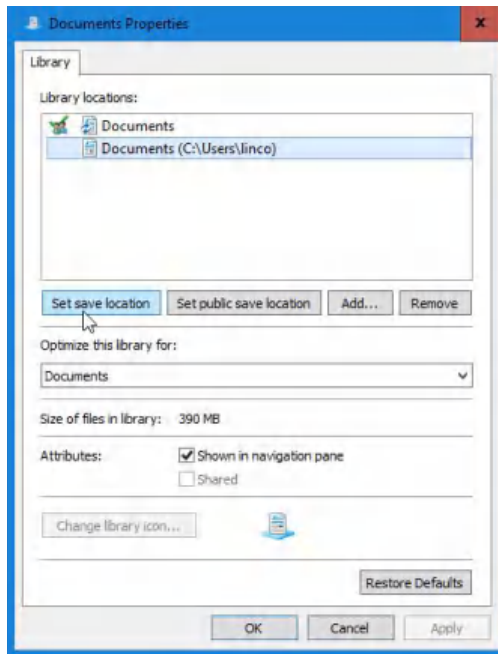


folders listed below it) and select Properties. In the resulting dialog box, select the local location (probably C:\Users\yourname, where yourname is your login name) and click Set save location button.

When you close the dialog box, your local Documents folder will be your default Documents folder. While both folders will be part of the library, new files will default to being saved locally.

Repeat moving the files and changing the library settings for your Music, Pictures, and Videos libraries. 🖱️

*Have a tech question? Ask PCWorld Contributing Editor Lincoln Spector. Send your query to [answer@pcworld.com](mailto:answer@pcworld.com).*

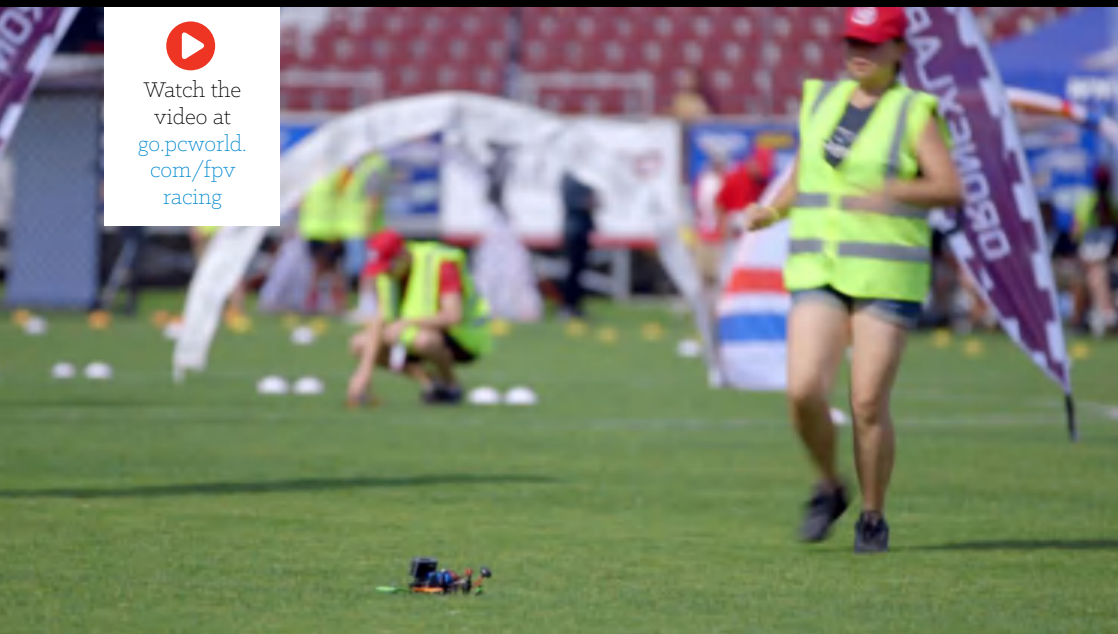


# Tech Spotlight

A video showcase of  
the latest trends



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## First-person-view drone racing: Five essential tips for beginning pilots

» Imagine a first-person-view video game where you're racing through the air and dodging obstacles. Losing even one-tenth of a second can cost you the race. Now imagine that it's not a video game. This is the sum-total experience of first-person-view (FPV) drone racing.

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